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Tools developed and disseminated by guideline producers to promote the uptake of their guidelines (Review)

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Tools developed and disseminated by guideline producers to promote the uptake of their guidelines.
Cochrane Database of Systematic Reviews 2016, Issue 8. Art. No.: CD010669.
DOI: 10.1002/14651858.CD010669.pub2.

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[Intervention Review]

Tools developed and disseminated by guideline producers to promote the uptake of their guidelines

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Editorial group: Cochrane Effective Practice and Organisation of Care Group.
Publication status and date: New, published in Issue 8, 2016.
Review content assessed as up-to-date: 3 February 2016.

Citation: Flodgren G, Hall AM, Goulding L, Eccles MP, Grimshaw JM, Leng GC, Shepperd S. Tools developed and disseminated by guideline producers to promote the uptake of their guidelines. *Cochrane Database of Systematic Reviews* 2016, Issue 8. Art. No.: CD010669. DOI: 10.1002/14651858.CD010669.pub2.

ABSTRACT

Background

The uptake of clinical practice guidelines (CPGs) is inconsistent, despite their potential to improve the quality of health care and patient outcomes. Some guideline producers have addressed this problem by developing tools to encourage faster adoption of new guidelines. This review focuses on the effectiveness of tools developed and disseminated by guideline producers to improve the uptake of their CPGs.

Objectives

To evaluate the effectiveness of implementation tools developed and disseminated by guideline producers, which accompany or follow the publication of a CPG, to promote uptake. A secondary objective is to determine which approaches to guideline implementation are most effective.

Search methods

We searched the Cochrane Effective Practice and Organisation of Care (EPOC) Group Specialised Register, Cochrane Central Register of Controlled Trials (CENTRAL); NHS Economic Evaluation Database, HTA Database; MEDLINE and MEDLINE In-Process and other non-indexed citations; Embase; PsycINFO; CINAHL; Dissertations and Theses, ProQuest; Index to Theses; Science Citation Index Expanded, ISI Web of Knowledge; Conference Proceedings Citation Index - Science, ISI Web of Knowledge; Health Management Information Consortium (HMIC), and NHS Evidence up to February 2016. We also searched trials registers, reference lists of included studies and relevant websites.

Selection criteria

We included randomised controlled trials (RCTs) and cluster-RCTs, controlled before-and-after studies (CBAs) and interrupted time series (ITS) studies evaluating the effects of guideline implementation tools developed by recognised guideline producers to improve the uptake of their own guidelines. The guideline could target any clinical area.

Data collection and analysis

Two review authors independently extracted data and assessed the risk of bias of each included study using the Cochrane 'Risk of bias' criteria. We graded our confidence in the evidence using the approach recommended by the GRADE working group. The clinical conditions targeted and the implementation tools used were too heterogenous to combine data for meta-analysis. We report the median absolute risk difference (ARD) and interquartile range (IQR) for the main outcome of adherence to guidelines.

Main results

We included four cluster-RCTs that were conducted in the Netherlands, France, the USA and Canada. These studies evaluated the effects of tools developed by national guideline producers to implement their CPGs. The implementation tools evaluated targeted healthcare professionals; none targeted healthcare organisations or patients.

One study used two short educational workshops tailored to barriers. In three studies the intervention consisted of the provision of paper-based educational materials, order forms or reminders, or both. The clinical condition, type of healthcare professional, and behaviour targeted by the CPG varied across studies.

Two of the four included studies reported data on healthcare professionals' adherence to guidelines. A guideline tool developed by the producers of a guideline probably leads to increased adherence to the guidelines; median ARD (IQR) was 0.135 (0.115 and 0.159 for the two studies respectively) at an average four-week follow-up (moderate certainty evidence), which indicates a median 13.5% greater adherence to guidelines in the intervention group. Providing healthcare professionals with a tool to improve implementation of a guideline may lead to little or no difference in costs to the health service.

Authors' conclusions

Implementation tools developed by recognised guideline producers probably lead to improved healthcare professionals' adherence to guidelines in the management of non-specific low back pain and ordering thyroid-function tests. There are limited data on the relative costs of implementing these interventions.There are no studies evaluating the effectiveness of interventions targeting the organisation of care (e.g. benchmarking tools, costing templates, etc.), or for mass media interventions. We could not draw any conclusions about our second objective, the comparative effectiveness of implementation tools, due to the small number of studies, the heterogeneity between interventions, and the clinical conditions that were targeted.

PLAIN LANGUAGE SUMMARY

Effectiveness of tools developed and disseminated by guideline producers to improve uptake of their guidelines

Background

Clinical practice guidelines (CPGs) are evidence-based recommendations for healthcare professionals about the care of patients with specific conditions. The uptake of CPGs by healthcare professionals is inconsistent, despite their potential to improve the quality of health care and patient outcomes. Some guideline producers have addressed this problem by developing tools to encourage the adoption of new guidelines.This review focuses on the effectiveness of tools developed and distributed by recognised guideline producers to improve the uptake of their CPGs.

Characteristics of included studies

Researchers from Cochrane searched the literature up to February 2016 and identified four randomised studies evaluating the effects of tools developed by recognised guideline producers to implement their guidelines. These were developed by guideline producers in France, the Netherlands and in the USA and Canada. In all four studies the interventions targeted the healthcare professional. None of the tools specifically targeted the organisation of care or the patient. The clinical conditions, and the healthcare professionals' behaviour targeted by the CPG, varied across studies, as did the tools used to improve guideline implementation.

Key results

Two of the four included studies reported on how well healthcare professionals stick to guideline recommendations when providing care to their patients, depending on whether they received a CPG with a tool aimed at improving the use of the CPG, or if they received the CPG only. The results of this review show that healthcare professionals who received a guideline tool together with the CPG on the management of non-specific low back pain or ordering thyroid-function tests probably stick more closely to the recommendations,

compared with those who received the CPG only. A guideline tool aimed at improving the use of a guideline, may lead to little or no difference in cost to the health service.

Certainty of the included evidence

The included evidence was from randomised controlled trials, which is considered the highest level of evidence. However, due to high risk of bias in the included studies our confidence in the effect on observing guideline recommendations was moderate. Our confidence in the evidence for cost effectiveness was low, since only a single study provided evidence for this comparison.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

Clinical practice guideline (CPG) + implementation tool compared with CPG only for adherence to guidelines

Patient or population: Healthcare professionals (physiotherapists, hospital physicians) providing care for people with different clinical conditions (patients with non specific low back pain, patients with symptoms indicating a need for a thyroid function test)
Setting: Private physiotherapy clinics in the Netherlands, general hospitals in France
Intervention: CPG + guideline implementation tool (e.g. training workshops, paper-based materials and order forms, reminders, web-based tools)
Comparison: CPG only

Outcomes	Median ARD (Absolute risk difference) (IQR)	No of Participants (studies)	Certainty of the evidence (GRADE)	Comments
Adherence to guidelines	Guideline tools provided to healthcare professionals as an aid to improve the use of a CPG probably lead to improved adherence with the CPG, as compared to guidelines only. Median ARD: 0.135 (0.115 to 0.15.9) at mean 4 weeks follow-up	68 physio- therapy practices; and 6 hospitals (2 C-RCTs)	⊕⊕⊕◯ **moderate**[1]	2 of the 4 included studies reported a proxy measure for adherence to guidelines, and results from these studies could therefore not be included in the ARD calculation
Costs	Guideline tools aimed at improving the use of guidelines may lead to little or no difference in healthcare costs	68 physio- therapy clinics (1 C-RCT)	⊕⊕◯◯ **low**[2]	1 trial reported no difference in mean direct annual cost* per patient between intervention and control groups. 1 French paper belonging to 1 of the included trials (6 hospitals) and reporting on costs awaits translation

* Direct costs included costs of the dissemination of the guideline and healthcare resource use by the patient
GRADE Working Group grades of evidence
High certainty: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: We are very uncertain about the estimate

[1]We downgraded the certainty of the evidence one step due to high risk of bias.
[2]We downgraded the certainty of the evidence two steps due to imprecision.

BACKGROUND

The uptake of clinical practice guidelines (CPGs) is inconsistent, despite their potential to improve the quality of health care and patient outcomes (Grol 2003; Schuster 1998; Seddon 2001). A variety of tools to improve the uptake of CPGs have been developed, but not always by the guideline producers themselves. This review focuses on the effectiveness of tools developed and distributed by guideline producers to improve the uptake of their CPGs. These tools are either embedded within a guideline, for example tailoring a guideline recommendation for a particular user group, or they accompany the CPG, for example interactive learning modules developed to support the use of a CPG.

Description of the condition

CPGs have the potential to improve healthcare delivery and outcomes, but the adoption of guidelines by healthcare professionals and health system managers is inconsistent, and gaps remain between recommended care and clinical practice. Previous systematic reviews have identified a range of interventions to support the implementation of guidelines (Grimshaw 2004). However, most of these have been developed independently of the producers of guidelines. In response to this some guideline producers have developed tools to improve the uptake of their CPGs. Some of these interventions focus on improving the skills needed to apply evidence to practice and others aim to integrate the content of a CPG into a local healthcare system. The value of these tools has been questioned by the UK National Institute for Health and Care Excellence (NICE), (New Reference, Leng 2013 [pers comm]) as they are an additional investment for the guideline producer, and the evidence of the effectiveness of this approach is uncertain.

Description of the intervention

Interventions developed and disseminated by guideline producers to improve the consistent use of CPGs by health professionals and health system managers include learning modules (which may be accredited with Continuing Medical Education (CME) points), education outreach visits (for example, academic detailing), communication tools (for example, press releases following the publication of CPGs) or tailored formatting (for example, the wording of recommendations adapted for a target audience or local health system). Learning modules are a popular approach to supporting the use of CPGs; for example, NICE has developed a range of online educational tools (NICE 2012b) in collaboration with BMJ Learning, the *Nursing Times* and e-Learning for Health (for example the eVTE online educational tool to reduce the risk of venous thromboembolism (eVTE 2013)). The goal is to enable users of CPGs to be more aware of recent evidence as summarised in the relevant NICE guidance and to apply the newly acquired knowledge in their practice and address any potential barriers. Examples of CPG producers working within health systems to improve the uptake of their CPGs include: NICE working within the National Health Service (NHS) in England and Wales by providing commissioners with quality standards (NICE 2016); the Scottish Intercollegiate Guidelines Network (SIGN) which provides problem-based small-group learning modules (SIGN 2012); the American College of Cardiology providing a guideline clinical app and running the Guidelines in Practice (GAP) project to provide customised, guideline-specific implementation tools (ACC 2016; Mehta 2002); the Veterans Health Administration adapting their CPGs for colorectal screening to local health organisations; Kaiser Permanente's healthcare system which has developed and implemented their Proactive Officer Encounter Programme to provide clinical decision support to increase the uptake of their own and other CPGs (Kanter 2010); and the National Prescribing Centre in the UK that set up the 'communities of practice' (the NHS Medicines and prescribing communities of practice). Data from NHS Evidence show that 92% (33/36) of guideline producers submitting their CPGs for accreditation by NHS Evidence publish support tools intended to aid implementation of their guidance (NHS 2012a). Many guideline producers are working on transforming their narrative CPGs into electronic format, as this may improve uptake through the implementation of CPGs in computer-based decision-support systems (Peleg 2010).

How the intervention might work

Producers of CPGs who develop implementation interventions to support their use have focused on the information needs of different user groups. Interventions are aimed at improving awareness of CPGs, strengthening the skills needed to understand and implement a CPG, and supporting the use of a CPG within the context of a local healthcare system (Greenhalgh 2005). Tailoring the implementation of interventions to facilitate practice change (to promote a CPG) typically involves identification of the deter-

minants of healthcare practice. This can include discussions with healthcare professionals about potential barriers and systems requiring change (Baker 2015), identification of ways to facilitate change and designing, applying and assessing appropriate interventions (Wensing 2011). The Guideline Implementability Appraisal (GLIA) instrument may be used by producers of guidelines to identify barriers to implementation during the design phase of a CPG and enable modifications prior to publication (Shiffman 2005). For example, templates may be developed for users of CPGs to populate with local data in order to assess the applicability and impact of a CPG. The tailoring process is also important in engaging clinicians in the implementation process (Horbar 2004; Titler 2009). Findings from a recent survey of more than 300 NHS commissioning staff, who use CPGs to guide decision making, confirm the importance of these approaches. Local public health intelligence, expert advice and examples of best practice appear to be the most sought-after types of evidence, and in order for knowledge to be used it has to be translated into a practical resource (Gkeredakis 2011). Finally, if a guideline producer has authority and works within the health system, or is perceived to be influential, the uptake of CPGs may be improved (Rogers 1995).

Other determinants of the effective implementation of all CPGs are that they are clearly written, specific to a population and context, easy to use and that there is research evidence of its effectiveness for a particular end-user's work context (Titler 2001). Guideline development is usually carried out by a multidisciplinary, nationally-representative group, who conduct a systematic review to identify and critically appraise the evidence, and who ensure that the guideline recommendations are explicitly linked to the supporting evidence. Expert opinions are also used in CPGs where research evidence is not available. Producers of guidelines can also use the AGREE tool by which the quality of a guideline may be evaluated, thus allowing end-users to decide how well a guideline has been developed and whether it will be applicable to the setting in which they are working (AGREE 2010).

The format used to communicate the content of a CPG can also influence its adoption (Greenhalgh 2005; Rogers 1995). While CPGs are frequently written as text documents (Peleg 2010), studies have shown that clinicians usually do not use written guidelines during the actual care process (Wang 2002). Instead, patient-specific advice, particularly if delivered during patient encounters, is suggested to be more effective in changing clinician behaviour (Shea 1996). Thus, implementing CPGs in computer-based decision-support systems may improve the acceptance and application of guidelines in daily practice, particularly if the actions and observations of healthcare workers are monitored and advice is generated whenever a guideline is not followed (Wang 2002). One example of guideline producers who have provided healthcare professionals with clinical decision support to increase the uptake of CPGs is the Kaiser Permanente healthcare system with their Proactive Officer Encounter Programme (Kanter 2010).

Gagliardi 2011 identified eight features of CPGs that are desired by users of CPGs, or are associated with their use:

1. Usability: the structure of the CPG has been modified to facilitate access, for example by providing a one-page summary of the recommendations;
2. Adaptability: the CPG is available in different formats for different users or purposes, for example, print and electronic format, versions of the CPG are available for patients and caregivers;
3. Validity: using a standardised system to grade the quality of evidence supporting each recommendation, for example GRADE;
4. Applicability: the wording of the CPG recommendation has been tailored for different target audiences to support application of the guidance to local circumstances; this may include clinical and contextual information;
5. Communicability: information to supplement the CPG, for example, educational resources for patients and information to support patient involvement;
6. Accommodation: the addition of information on costs and resources, for example, the costing templates provided by NICE, and information on competencies and training required to implement the recommendations;
7. Implementation: information on potential barriers and strategies for facilitating implementation, for example, a clinical assessment using a point-of-care template;
8. Evaluation: performance measures or quality indicators for audit and monitoring.

Why it is important to do this review

CPGs can improve healthcare delivery and outcomes, but the adoption of guidelines by clinicians and healthcare managers is inconsistent. Previous Cochrane Reviews have described the effectiveness of a range of interventions to support the implementation of guidelines (Akl 2013; Flodgren 2011; Flodgren 2013a; Forsetlund 2009; Giguère 2012; Grilli 2002; Jamtvedt 2006; O'Brien 2007; Shojania 2009). However, most of these have been developed independently of the producers of guidelines. Responding to continued concern about the inconsistent use of CPGs, some national guideline producers have developed and implemented tools to support the uptake of their CPGs. This is an additional investment for the guideline producer and the effectiveness of this approach is not known. The focus of this review is to assess the effectiveness of implementation tools, developed and disseminated by guideline producers, on the uptake of their guidelines. These tools may require changes to the presentation of the CPG (e.g. tailoring of a CPG), or to be published alongside CPGs (e.g. online learning modules).

OBJECTIVES

To evaluate the effectiveness of implementation tools developed and disseminated by guideline producers, which accompany or follow the publication of a CPG, to promote uptake.

A secondary objective is to determine which approaches to guideline implementation are most effective.

METHODS

Criteria for considering studies for this review

Types of studies

We aimed to include randomised controlled trials (RCTs), cluster-randomised trials (C-RCTs), controlled before-and-after studies (CBAs) and interrupted time series (ITS) studies evaluating the effects of guideline implementation tools developed by recognised guideline producers to improve the uptake of their own guidelines. CBAs were eligible for inclusion if they involved at least two intervention and two control sites, and ITS studies were eligible if they had at least three data points before and three data points after the intervention.

Types of participants

We included all qualified healthcare professionals, health system managers and policy makers.
We excluded studies involving trainees or medical students.

Types of interventions

We included any interventions developed by producers of CPGs to improve guideline implementation. Guideline producers include, for example, the World Health Organisation (WHO), NICE, and SIGN. As guidelines may be produced for a specific jurisdiction, health system, or group of healthcare professionals, interventions to improve the implementation of these CPGs may be distributed to organisations but targeted at individuals within the organisation, or they may be targeted at entire organisations. We used the definition of a CPG developed by the USA Institute of Medicine: "clinical guidelines are systematically developed statements to assist health care professional and patient decisions about appropriate health care for specific clinical circumstances" (Field 1990).
Using the EPOC taxonomy (EPOC taxonomy 2002) as a guide, we developed the following classification to organise and define interventions as below:

1. Tools targeting the healthcare professional

i) Tailoring

- Tailoring of CPGs for different users to improve usability and applicability: examples include using different wording, varying the content, incorporating case studies of patients' experiences in the form of vignettes or narratives which contextualise the recommendations.
- Different CPG formats adapted for different users/purposes, e.g. electronic (for use on a Personal Digital Assistant), paper, multimedia versions, summaries, the inclusion of algorithms.

ii) Education

- Learning modules (to include interactive learning modules) which may be accredited with Continuing Medical Education (CME) points, or to support the use of audit by junior doctors.
- Instructions/templates, e.g. instructions, tools or templates to tailor guidelines/recommendations for local context (may also be used at the organisational level); point-of-care templates/forms (clinical assessment, standard orders).
- Decision-support systems, e.g. electronic guidelines with built-in decision-support systems.

2. Tools targeting the patient

- Producing versions of CPG recommendations for the public to improve provider-patient communication about guideline recommendations.

3. Tools targeting the organisation of care

- Benchmarking tools, e.g. measures of gaps in performance to be used by those monitoring the implementation of CPGs (may also be used by individual healthcare professionals).
- Costing templates as a budgetary aid (may also be used by individual healthcare professionals) to assess the resources required to implement the CPG.
- Programme evaluation, audit tools, performance measures and quality indicators to evaluate the implementation of the CPG.

4. Mass media interventions

- Press releases following the publication of a CPG.

The comparisons are as follows:

1. Tools developed by a guideline producer versus a tool developed by another organisation or a guideline user (i.e. tools developed independently of the CPG producer).
2. Tools developed by a guideline producer versus no tool (i.e. CPGs alone).

We excluded the following types of studies/interventions:

1. Tools developed by groups of researchers, guideline groups on commission (no longer existing).
2. Studies describing tools developed by guideline producers to improve guideline uptake without providing objective measurements of the effect of these interventions on professional practice or patient outcomes.
3. Surveys of barriers/facilitators to the uptake of guidelines.

Types of outcome measures

We included studies reporting the following outcome measures:

Main outcomes

Objective measures of healthcare professional performance, healthcare resource use or patient outcomes.

Secondary outcomes

Self-reported measures of healthcare professional performance and healthcare manager performance, including knowledge or use of CPGs, and costs.

We excluded studies that only included self-reported outcomes.

Search methods for identification of studies

Electronic searches

Information specialist Nia Roberts (NR) developed the search strategy for MEDLINE in consultation with the review authors, and searched the *Cochrane Database of Systematic Reviews* and the Database of Abstracts of Reviews of Effects (DARE) up to February 2016 for related systematic reviews, and the following databases for primary studies.

- Cochrane Effective Practice and Organisation of Care (EPOC) Group Specialised Register, Reference Manager
- Cochrane Central Register of Controlled Trials (CENTRAL) (Cochrane Library), Wiley (3 February 2016)
- NHS Economic Evaluation Database, HTA Database (Cochrane Library), Wiley (3 February 2016)
- MEDLINE and MEDLINE In-Process and other non-indexed citations, OvidSP (1946 to 3 February 2016)
- Embase, OvidSP (1974 to 3 February 2016)
- PsycINFO, OVIDSP (1967 to 3 February 2016)
- CINAHL (Cumulative Index to Nursing and Allied Health Literature), EbscoHost (1982 to 3 February 2016)
- Dissertations and Theses, ProQuest (3 February 2016)
- Index to Theses (up to 3 February 2016)
- Science Citation Index Expanded, ISI Web of Knowledge (1945 to 3 February 2016)
- Conference Proceedings Citation Index - Science, ISI Web of Knowledge (1990 to 3 February 2016)
- Health Management Information Consortium (HMIC), NHS Evidence (1979 to 3 February 2016)

The MEDLINE search strategy (Appendix 1) was translated for other databases using appropriate syntax and vocabulary for those databases. The strategy included Medical Subject Headings (MeSH) and synonyms for guidelines and implementation. Results were limited by two methodological filters: the Cochrane Highly Sensitive Search Strategy (sensitivity- and precision-maximising version, 2008 revision) to identify randomised trials, and an EPOC methodology filter to identify non-RCT designs. We did not apply language or publication status restrictions. Search strategies for the other databases are found in Appendix 2; Appendix 3; Appendix 4; Appendix 5; Appendix 6; Appendix 7; Appendix 8; Appendix 9.

Searching other resources

We searched the following additional sources:

Grey literature

We conducted a 'grey literature' search to identify studies not indexed in the databases listed above. Sources included the sites listed in Appendix 10. We document guideline websites searched in Appendix 11.

Trial registries

We searched the following registries:

- International Clinical Trials Registry Platform (ICTRP), Word Health Organization (WHO) (www.who.int/ictrp/en/)
- ClinicalTrials.gov, US National Institutes of Health (NIH) (clinicaltrials.gov/)

We also :

- reviewed reference lists of all included studies, relevant systematic reviews/primary studies/other publications;
- contacted authors of relevant studies or reviews to clarify reported published information/seek unpublished results/data;
- contacted researchers with expertise relevant to the review topic/EPOC interventions, as well as guideline-producing bodies regarding any further published or unpublished research;
- conducted cited reference searches for all included studies in ISI Web of Knowledge.

Data collection and analysis

Selection of studies

We downloaded all titles and abstracts retrieved by electronic searching to the reference management database Endnote (EndNote X7) and removed duplicates. Four review authors (from GF, AH, LG, SS) and an additional systematic reviewer independently examined the remaining references, excluded those studies which clearly did not meet the inclusion criteria, and produced a long list of possible included studies. Two review authors (from GF, AH and SS) scrutinised these citations, obtained full-text copies of potentially relevant references, and independently assessed the eligibility of the retrieved full-text papers. We resolved disagreements by discussion among review authors.

Data extraction and management

Two review authors (from GF, AH and LG) independently extracted data from each study into a modified EPOC data extraction form. We resolved disagreements by discussion among review authors. We extracted the following information: setting; location; characteristics of healthcare professionals; type of healthcare organisation; intended population of guideline; type and target of intervention; the components of the intervention; the comparison intervention; any information about the time (and resources) needed to implement or use the tool, or both; costs and outcomes reported.

We also extracted data on any collaborative effort between producers and users of guidelines aiming to improve the development of implementation tools, e.g. engagement of individual healthcare professionals or the organisation of care or both in the development; assessment of barriers/facilitators to CPG adoption at the provider level or at the organisational level, or both; or assessment of the healthcare professionals' or the organisation of care's readiness to change.

We used the Review Manager 5 software developed by Cochrane (Review Manager 2014) to structure the content of the review when writing it up for publication.

Assessment of risk of bias in included studies

Two review authors (from GF, AH, and LG) independently assessed the risk of bias of each included study using the Cochrane's 'Risk of bias' tool (Higgins 2011) on six standard criteria:

1. Adequate sequence generation;
2. Adequate concealment of allocation;
3. Blinded or objective assessment of main outcome(s);
4. Adequately addressed incomplete outcome data;
5. Free from selective outcome reporting;
6. Free from other potential sources of bias.

We used four additional criteria specified by EPOC (EPOC 2015):

1. Similar baseline characteristics;
2. Similar baseline outcome measures;
3. Reliable main outcome measures;
4. Adequate protection against contamination.

We resolved disagreements by discussion among review authors. We assigned an overall assessment of the risk of bias (high, moderate or low risk of bias) to each of the included studies using the approach suggested in Chapter 8 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We considered studies with low risk of bias for all key domains, or where it seems unlikely that bias seriously alter the results, to have a low risk of bias. We rated studies as high risk of bias if at least one domain was unclear or studies were judged to have some bias that could plausibly raise doubts about the conclusions as being at moderate risk of bias. We considered studies with a high risk of bias in at least one domain or judged to have serious bias that decreases the certainty of the conclusions, to have a high risk of bias.

Measures of treatment effect

For each study, we reported data in natural units. Where baseline results were available from RCTs we reported pre-intervention and postintervention means or proportions for both study and control groups. We also calculated the absolute risk difference (ARD) for each reported dichotomous outcome, using baseline data when available.

Unit of analysis issues

There were no unit of analysis issues, all studies adjusted for clustering (Bekkering 2005; Daucourt 2003; Fine 2003; Shah 2014).

Dealing with missing data

We did not contact authors to request missing data, for example, when the main outcome was graphically presented without numerical data.

Assessment of heterogeneity

Due to the heterogeneity between studies in terms of populations, clinical conditions/targeted behaviour, and implementation tools used, meta-analysis was not feasible, and we therefore did not assess statistical heterogeneity.

Assessment of reporting biases

As meta-analysis of main outcomes was not feasible, we did not assess publication bias through a funnel plot. However, our search for studies to include was extensive and covered a number of guideline web sites, Guideline Clearing Houses and professional associations.

Data synthesis

As we did not find sufficiently homogeneous studies to permit meta-analysis, we reported, for dichotomous outcomes, the median of medians of effect sizes across studies, as has previously been done in other reviews (Flodgren 2011: Grimshaw 2004; Shojania 2009). When multiple adherence outcomes were reported within individual studies, we first calculated the median effect size (range) across all outcomes reported in each study, and then calculated the median of medians and interquartile range (IQR) across studies. Two review authors used the GRADE tool (www.gradeworkinggroup.org/) to judge the overall certainty of the evidence for each outcome, using the following domains: risk of bias, inconsistency, imprecision, indirectness and publication bias. We downgraded the evidence for serious concerns about each of these domains. We resolved disagreements through discussions among the review authors. We presented the grading of the evidence in Summary of findings for the main comparison.

Subgroup analysis and investigation of heterogeneity

As all of the included studies used implementation tools that targeted the healthcare professional, and only one study targeted both the healthcare professional and the patient, we did not undertake any subgroup analyses.

Sensitivity analysis

We did not perform a sensitivity analysis, as no meta-analysis was conducted.

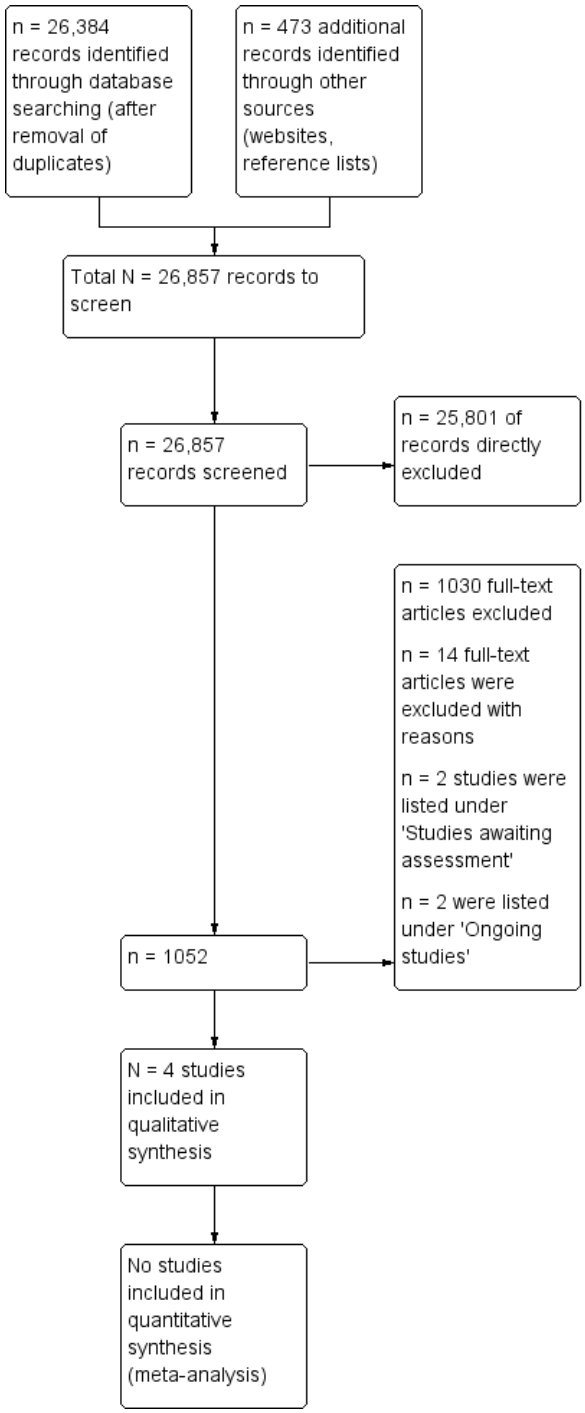
RESULTS

Description of studies

Results of the search

See Characteristics of included studies; Characteristics of ongoing studies and Characteristics of studies awaiting classification tables. The electronic searches yielded 47,181 citations, down to 26,384 after removal of duplicates. Additional sources searched (including websites and reference lists) yielded 473 citations. Of the these 26,857 citations, we excluded 25,801 irrelevant studies and retrieved and scrutinised 1,056 studies. Of these 1,056 double-screened studies we excluded 1030 studies and added 14 to the excluded studies table. We listed one study protocol and one conference abstract under 'Ongoing studies' (Salbach 2014; Te Boveldt 2011), and two studies under 'Studies awaiting classification' (Maximov 2012; Van Driel 2007). We judged four studies to be eligible for inclusion in the review. See study flowchart Figure 1.

Figure 1. Study flow diagram.



Included studies

We identified four eligible studies of cluster-RCTs (Bekkering 2005; Daucourt 2003; Fine 2003; Shah 2014) for inclusion in this review, of which one (Shah 2014) consisted of two separate cluster-RCTs: one a population-based C-RCT including all family practices in Ontario, Canada, and the other an embedded C-RCT including a subsample of the family practices from the larger study.

Populations

Healthcare professionals

In Bekkering 2005 the participants were physiotherapists (n = 113); and in two studies (Daucourt 2003; Fine 2003) the participants were physicians other than general practitioners (GPs) (n = 1913), or family physicians (number not reported), and in one study the intervention was targeted at family physicians (Shah 2014). None of the studies targeted patients, health system managers or policy makers.

Patients

The number and clinical condition of participants in the included studies were as follows: participants (n = 500) with non-specific low back pain (Bekkering 2005); participants (n = 608) with hospital-acquired pneumonia (Fine 2003); an unknown number of patients who required a thyroid-function test (Daucourt 2003); and people with diabetes > 40 years old (n = 933,769) in Ontario (administrative study) and a subgroup of people with diabetes (n = 1592) at high risk of cardiovascular disease (clinical study) (Shah 2014).

Settings

Bekkering 2005 was set in private physiotherapy practices (n = 68); two studies (Daucourt 2003; Fine 2003) were set in hospitals (n = 13), and Shah 2014 was set in family practices (n = 4007 and n = 80 respectively). The studies were conducted in the Netherlands (Bekkering 2005), France (Daucourt 2003), the USA (Fine 2003) and in Canada (Shah 2014) .

Targeted behaviour

The clinical conditions/behaviours targeted by the CPG were as follows: care for people with non-specific low back pain (Bekkering 2005); appropriate thyroid-test ordering (Daucourt 2003); timely conversion (and discharge) from intravenous antibiotic therapy to oral antibiotics for people with pneumonia (Fine 2003); and improved cardiovascular risk screening and risk reduction in people with diabetes (Shah 2014).

The guideline recommendations (n = 4) that were implemented were described in one of the studies (Bekkering 2005).

Guideline producers

See Table 1 for details on the guideline development process.

In Bekkering 2005 the Royal Dutch Physiotherapy Association developed the guidelines; in Daucourt 2003 the Committee for Co-ordinating Clinical Evaluation and Quality in Aquitaine (CCECQA) developed the guidelines, together with regional groups and national guideline developers; in Fine 2003 members of the Pneumonia Patient Outcomes Research Team (PORT) project developed the guidelines; and in Shah 2014 the Canadian Diabetes Association (CDA) developed the guidelines.

Description of the intervention

See Table 2 , and Table 3.

i) Interventions targeting the healthcare professional

All four studies evaluated guideline implementation tools targeting the healthcare professional.

Tailored interventions

Bekkering 2005 assessed the effectiveness of two (2½ hours) educational training sessions for groups of 8 to 12 physiotherapists on adherence to CPGs for management of non-specific low back pain. The sessions were based on interventions reported as being effective in the literature (e.g. interactive education and discussion, feedback, and reminders) and were tailored to barriers found in a survey.

Printed materials

Three studies evaluated the effectiveness of paper-based educational materials or reminders, or both (Daucourt 2003; Fine 2003; Shah 2014).

Daucourt 2003 evaluated the combined effect of two tools: a memorandum pocket card and a test request form to implement guidelines for appropriate thyroid-test ordering. Orders were made by checking a box, with boxes corresponding to inappropriate test ordering shaded and therefore making ordering impossible.The physician could overrule this by writing the order at the bottom

of the sheet. The pocket card summarised the recommendations according to the various clinical or therapeutic situations requiring a thyroid test.

In Fine 2003 physicians received a multifaceted guideline intervention which included placement of a detail sheet in the patient's medical record once a patient met guideline criteria for stability when receiving intravenous antibiotic therapy for pneumonia, a follow-up recommendation to the attending physician, and an offer to arrange follow-up home nursing care. The three site-specific detail sheets promoted any of three recommended action(s), i.e. conversion from intravenous to oral antibiotic therapy only, conversion and hospital discharge, or hospital discharge only.

Shah 2014 used a cardiovascular disease toolkit which was a collection of printed educational materials, packaged in a brightly-coloured box with CDA branding, sent to Canadian family physicians. The contents included an introductory letter from the Chair of the practice guidelines' Dissemination and Implementation Committee; an eight-page summary of selected sections of the practice guidelines targeted towards family physicians; a four-page synopsis of the key guideline elements pertaining to cardiovascular disease risk; a small double-sided laminated card with a simplified algorithm for cardiovascular risk assessment, vascular protection strategies, and screening for cardiovascular disease; and a pad of tear-off sheets for patients with a cardiovascular risk self-assessment tool and a list of recommended risk reduction strategies.

The median duration that an intervention was delivered was 22 weeks (range 4 weeks to 12 months).

ii) Interventions targeting the patient

None of the included studies evaluated interventions that targeted the patient.

iii) Interventions targeting the organisation of care

None of the included studies evaluated interventions that exclusively targeted the organisation of care.

iv) Interventions targeting the healthcare professionals and the patients

None of the included studies evaluated targeted both healthcare professionals and patients.

Assessment of barriers

In one of the three included studies (Bekkering 2005), barriers to guideline implementation were assessed through the means of a survey to inform the shape and content (i.e. tailoring) of the guideline implementation strategies. Another aim of the survey was to retrieve information on the most important discrepancies between current practice and recommendations of the guidelines. A model for changing professionals' behaviour and systematic reviews on the effectiveness of implementation interventions was also used to determine the content of the implementation strategy.

Theory base of interventions

None of the interventions used in the included studies was theory-based.

Evidence base of interventions

The implementation strategies used in the included studies were all supported by some evidence of their effectiveness and cited high-quality Cochrane Reviews, systematic reviews or overviews to justify their choice of strategies.

Fidelity

None of the included studies provided information on intervention fidelity.

Delivery of the intervention

Mode of delivery:

In Bekkering 2005 the intervention was delivered face-to-face. In two studies (Daucourt 2003; Shah 2014) the paper-based interventions were provided passively. In Fine 2003 one part of the intervention was delivered over the phone, and the rest passively in the form of paper-based materials.

Provider delivering the intervention (if not electronic, paper-based, etc):

In Bekkering 2005 the principal investigator and two additional trainers delivered the intervention. In Fine 2003 a nurse delivered part of the intervention.

Comparison interventions

The comparison intervention in all included studies was passive guideline dissemination. Additional material that was delivered together with the guideline was as follows: in Bekkering 2005 four forms: a self-evaluation form to assess whether their current management was consistent with the recommendations contained in the clinical guidelines, two forms facilitating discussion with other physiotherapists and general practitioners respectively, a copy of

the Quebec Back Pain Disability Scale, and a summary of the CPG. In Fine 2003 a cover letter was sent signed by the hospital's utilisation management director describing the rationale for the guideline. In Daucourt 2003 all physicians were invited to a local information meeting. In Shah 2014 control participants received the CDA newsletter, which included the revised guideline.

Outcomes

Healthcare professional outcomes

Two of the four included studies reported a measure of healthcare professional adherence to guidelines (Bekkering 2005; Daucourt 2003) at four weeks; these were included in the calculations of the median absolute risk difference (ARD).

Healthcare resource use and costs

Fine 2003 reported length of initial hospital stay and re-admissions at 30 days after index hospitalisation. Shah 2014 reported (primary outcome in clinical study) the proportion of patients with diabetes at high risk of a cardiovascular event who were prescribed a statin (see Table 4 for details on secondary outcomes reported).
Two studies reported on costs (Bekkering 2005; Saillour-Glénisson 2005 (belonging to Daucourt 2003)). One of the studies reported mean annual cost per patient, total cost for releasing the guideline and cost of active implementation intervention (Bekkering 2005). The other article awaits translation (Saillour-Glénisson 2005).

Patient outcomes

Bekkering 2005 reported quality-of-life measures at four weeks. Fine 2003 reported all-cause and pneumonia-related mortality, medical complications, functional status and patient satisfaction with care at 30 days after the initial hospitalisation. Shah 2014 reported (primary outcome in administrative data study) death or non-fatal myocardial infarction. Daucourt 2003 reported the number of requests for a thyroid function test that complied with the guidelines (Guideline Conformity Rate (GCR)) at 4 weeks. (See Table 4 for details of the secondary outcomes reported).

Excluded studies

After scrutinising the full text we excluded 1030 studies and added 14 to the excluded studies table. See Characteristics of excluded studies table.

Risk of bias in included studies

See 'Risk of bias' tables within the Characteristics of included studies, Figure 2 and Figure 3.

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study. White space indicate studies not reporting non-objective outcomes and for which risk of bias could not be assessed.

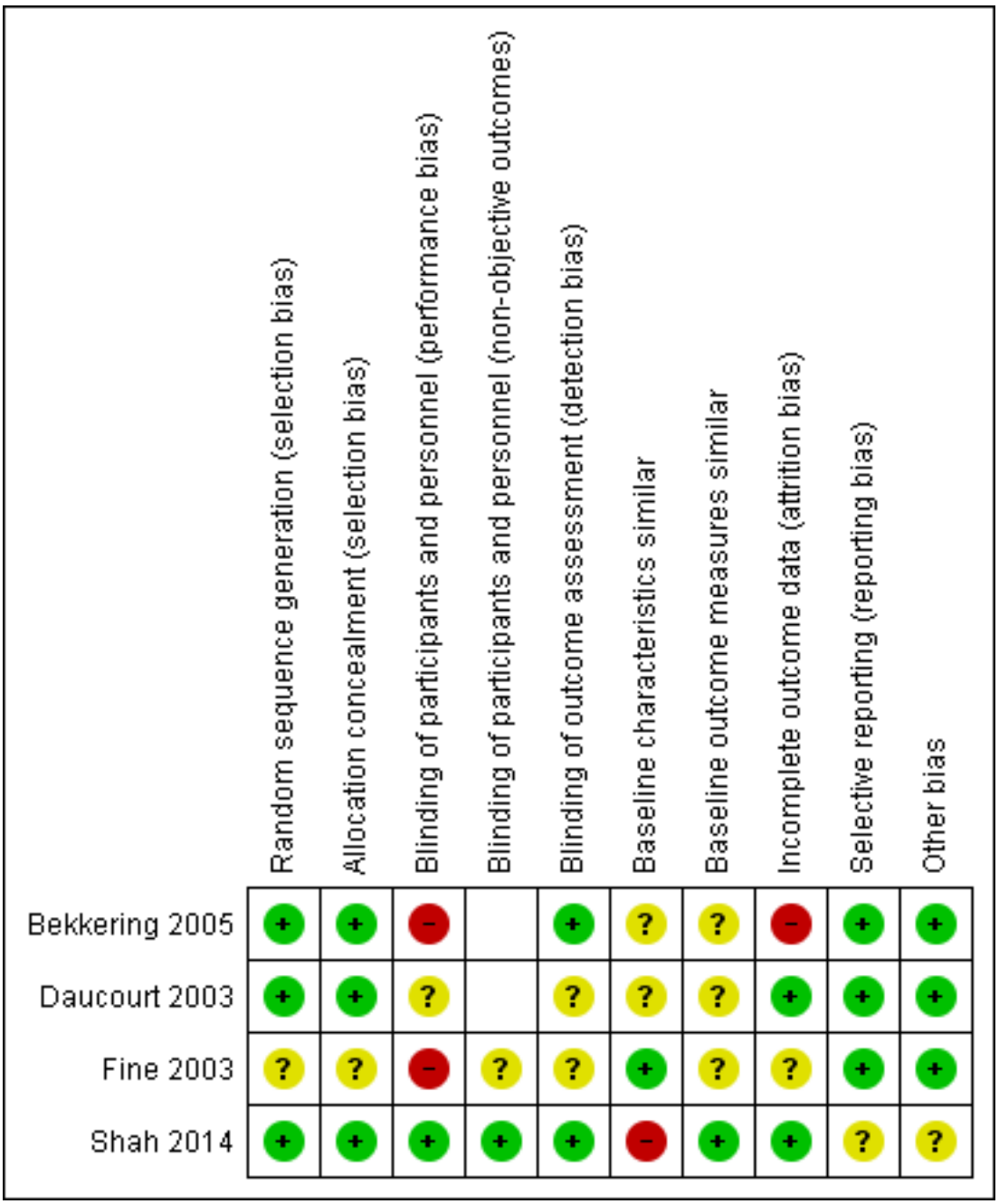
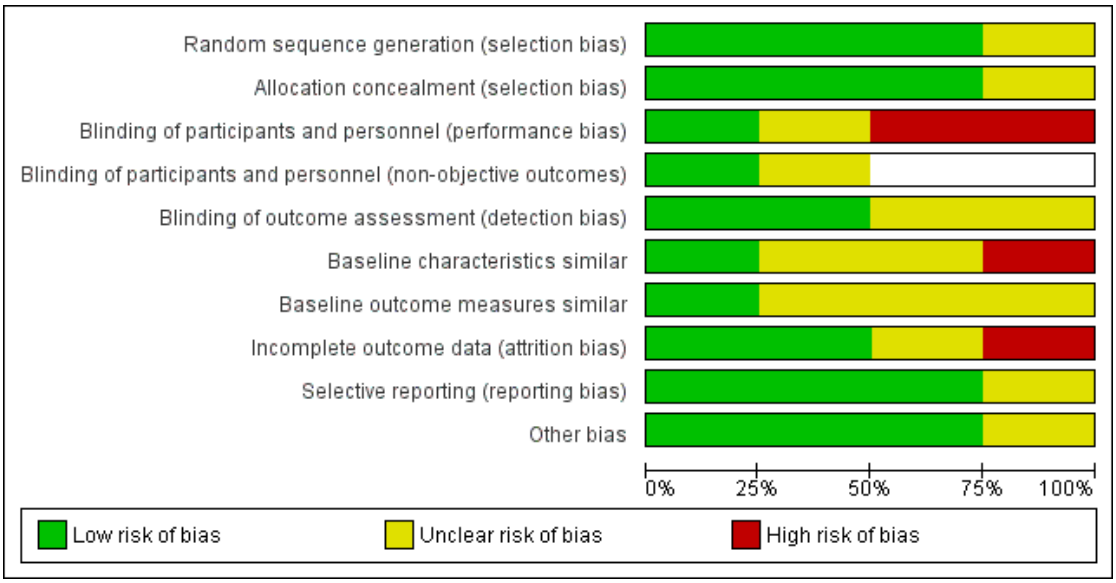


Figure 3. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies. White spcace indicate studies not reporting non-objective outcomes and for which risk of bias could not be assessed.



The randomisation sequence and the allocation concealment were adequate in three studies (Bekkering 2005; Daucourt 2003; Shah 2014), and unclear in Fine 2003. In Shah 2014 blinding was adequate (clinical data study assessed), and in Daucourt 2003 it was unclear whether or not the healthcare professionals were blinded, while in two studies (Bekkering 2005; Fine 2003) it was clear that they were not. In one study the healthcare professional selected a maximum of 10 consecutive patients for the study, and we therefore judged the risk of performance bias to be high (Bekkering 2005). Performance bias was also judged high in Fine 2003 as treatment assignment was not concealed. Blinding of outcome assessment was adequate in two studies (Bekkering 2005; Shah 2014), and unclear in the other two. Baseline characteristics were reported to be similar in one study (Fine 2003), not similar in one study (Shah 2014), and unclear in the other two studies. The outcome data were complete in two studies (Daucourt 2003; Shah 2014), and unclear in the other two (with losses to follow-up of more than 20%). In Shah 2014 some of the outcomes that were listed in the trial protocol were not in the study report, while in the other three studies the risk of selective reporting was low. Shah 2014 had unclear risk of other bias (contamination), while the other three were at low risk.

Effects of interventions

See: **Summary of findings for the main comparison**

i) Interventions targeting the health care professionals

Healthcare professional outcomes

See Summary of findings for the main comparison; Table 4 and Table 5.

Two of the four included studies (Bekkering 2005; Daucourt 2003) reported one or more measures of healthcare professionals' adherence to guidelines. The overall median absolute risk difference (range) (five comparisons) was (range: 0.115 to 0.159), i.e. a median difference in adherence of 13.5%, with the effects ranging from 11.5% to 15.9% increase in adherence.

Fine 2003, in which physicians received an educational mailing, a daily assessment of (pneumonia) patient stability and an additional sheet to the medical notes with a follow-up recommendation for converting from intravenous to oral antibiotic and hospital discharge, compared with education mailing alone, reported that those in the intervention group had a more rapid rate of conversion to oral antibiotics (hazard ratio (HR) 1.23, 95% confidence

interval (CI) 1.00 to 1.52, P = 0.06). Shah 2014 did not report health professional outcomes.

Healthcare resource use and costs

Fine 2003 reported similar percentages in each group of patients being readmitted (intervention group 14% versus 11% in the control group), and a similar length of initial hospital stay (median of five days in each group) at 30 days after index visit.
Shah 2014 reported similar or slightly lower (= undesired effect) use of different types of coronary artery disease (CAD) assessment tools in practices that received the guideline tool compared to those who received the updated guideline only (administrative data study), as was the case for the medication initiation outcomes (both were secondary outcomes).
Bekkering 2005 reported mean annual direct medical costs for the intervention group of EUR 374 versus EUR 449 in the control group. Direct costs included costs of the dissemination of the guideline and healthcare resource use by the patient. Daucourt 2003 reported prescribing cost data in a paper in French (Saillour-Glénisson 2001) which awaits translation.

Patient outcomes

See Table 4 for details
Bekkering 2005 reported similar quality-of-life scores for patients with non-specific low back pain at 12 months.
Fine 2003 reported similar scores on the SF-12 physical component score (intervention group 45 (standard deviation (SD) 7) versus control group 45 (SD 7)) and the mental component score (intervention group 45 (SD 6) versus control group 45 (SD 7)) at 30 days after index stay, and little or no difference for mortality (intervention group 8% versus control group 9%), and return to work (HR 0.99, 95% CI 0.63 to 1.58). The same authors reported fewer hospital complications in the intervention group compared with control (157 (55%) and 206 (63%) respectively, P = 0.04).
Shah 2014 reported little or no difference between groups (Intervention 2.5%; Control 2.5%; odds ratio (OR) 1.00, 95% CI 0.96 to 1.03, P = 0.77) for death and non-fatal myocardial infarction (primary outcome in the administrative data study), and also little or no difference for any of the other (secondary) clinical events reported (see Table 4 for details).

ii) Interventions targeting the organisation of care

No studies reported results for this comparison.

iii) Interventions targeting the patient

No studies reported results for this comparison.

iv) Interventions targeting the healthcare professional, the organisation of care and/or the patient

No study reported results for this comparison.

Effectiveness of different approaches of guideline dissemination

We include four studies in this review, of which one evaluated the effectiveness of two short tailored educational workshops, and the other three studied the effects of using paper-based tools, including order forms or reminders, or both. As the types of multifaceted interventions, the clinical condition and behaviour targeted varied across studies it was not possible to determine which of the different approaches used to improve implementation of guidelines was most effective.

DISCUSSION

Summary of main results

We identified four eligible cluster-RCTs for inclusion in this review, evaluating the effects of tools developed by existing guideline producers to improve implementation of their guidelines.
All included studies evaluated tools that targeted the healthcare professional. However, meta-analysis was not feasible, since the targeted clinical conditions and behaviour, as well as the guideline tools used, all varied between studies. The variation in the duration of interventions and follow-up also made comparisons difficult. Tools developed by guideline producers, and given to healthcare professionals as an aid to improve compliance, probably lead to greater adherence to guidelines (median absolute risk difference (ARD) 13.5%) at an average four weeks follow-up (moderate-quality evidence). The effect ranged from 11.5% in one study (two tailored short educational workshops to improve management of non-specific low back pain) to 15.9% in the other (a pocket memorandum card and test-request form to improve thyroid-test ordering). Neither study reported baseline adherence, and it appeared that no guideline for the specific targeted behaviours and conditions was previously in place. There was low certainty of evidence from one trial for little or no difference in costs between groups.
Due to the few eligible studies identified, and the variety of interventions implemented, we could not determine which approaches are most effective, which was the secondary objective of this review. Two of the included studies reported on cost data, and one of these awaits translation. While it is not possible to directly address the investment made by guideline producers in developing implementation tools, the cost is not likely to differ substantially from other organisations that develop tools to support the implementation of guidelines. It should be noted that even small to

moderate intervention effects may be highly cost-effective if the targeted clinical condition is highly prevalent and the implementation tools used are inexpensive to develop and to disseminate. There is no evidence available for the effectiveness of interventions targeting the organisation of care or the patient.

Overall completeness and applicability of evidence

In all included studies the interventions targeted the healthcare professional. None of the included studies used tools that targeted health system managers or policy makers, the patient (e.g. versions of the guideline developed for the patient), or the organisation of care (e.g. benchmarking tools, costing templates or programme evaluation, audit tools, performance measures and quality indicators to evaluate the implementation of the CPG), and no study evaluated the effects of mass media interventions. The implementation tools used were delivered alongside the CPG, and none was imbedded within the CPG (e.g. tailoring of the CPG for a specific audience). In addition, only guideline tools to promote the use of CPGs for a few clinical conditions and behaviours have been evaluated.

Quality of the evidence

The evidence was from cluster-RCTs that had all taken clustering into account in the analysis. We downgraded all included studies from high to moderate certainty of evidence for the main outcome (adherence to guidelines), due to high risk of bias. As only a single study provided evidence for the effectiveness of a certain implementation on costs, our confidence in the evidence was further downgraded to low due to imprecision.

Potential biases in the review process

We searched a large number of databases using a strategy that was designed by a senior information specialist, and then adapted for different databases. We also searched a large number of websites of relevant guideline producers. Four review authors sifted a number of references identified by the electronic searches, excluding papers that were irrelevant and clearly not eligible, and producing a long list for a second review author to go through. Two review authors independently assessed all potentially eligible titles and abstracts against the eligibility criteria to ensure no important references were missed. We also performed data extraction and assessment of risk of bias in duplicate.

Agreements and disagreements with other studies or reviews

We are not aware of any other reviews that have evaluated the effectiveness of tools developed by recognised guideline producers to improve implementation of their own CPGs. However, our results of a median 13.5% greater adherence to guidelines in the intervention group (two studies: one evaluating a paper-based intervention, and one an intervention consisting of two short educational workshops) are greater than the reported median absolute improvement in performance for point-of-care computer reminders of around 4% (Shojania 2009), 2% for printed educational materials (Giguère 2012) and 6% for educational meetings (Forsetlund 2009). These reviews, however, included a much larger number of studies and participants, which may explain the differences in effect.

AUTHORS' CONCLUSIONS

Implications for practice

There is a range of guideline tools that guideline producers could develop. However, for tools developed by large guideline-producing bodies, there is limited evidence about their effectiveness. It is difficult to draw robust conclusions about the tools evaluated in our review, given the small number of studies and heterogeneity in study conditions, interventions, and outcomes.

Implications for research

Given that many CPG developers are providing tools to support implementation, they should consider embedding rigorous evaluations of the tools (e.g. randomised trials) to advance knowledge in this area. They should also aim to include economic analyses to determine the cost effectiveness of their tools.

Future studies in this area should also aim to:

- study the effect of organisational interventions, patient interventions, and of tools embedded in a guideline (e.g. tailoring of the content to specific audiences) using a randomised comparison
- use validated objective measures of adherence to guidelines and longer follow-up
- report numerical data to accompany graphical figures
- describe the process of developing the guideline and the implementation tool, including any theory used, the evidence base for the intervention
- provide information on who developed the guidelines, and the guideline development process, as well as describing the number and complexity of the guideline recommendations
- provide information on who delivered the intervention (the study authors, independent personnel, etc.), and detailed

information on the intensity of interventions (number of face-to-face contacts, contact time, etc.) to permit replication and comparison with other studies

- use the TIDieR checklist (Hoffman 2014) to improve the reporting of the characteristics of an intervention

- conduct an economic evaluation, taking into account the development of the guideline, and the dissemination and implementation of the guideline.

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ACKNOWLEDGEMENTS

We wish to thank senior information scientist Nia Roberts at the Bodleian library (Oxford, UK), for developing the search strategy and for running the electronic searches. We would also like to acknowledge Hannah Parke (from King's improvement Science) for assistance with the sifting.

Lucy Goulding and Hannah Parke are staff members at King's Improvement Science, and they wish to acknowledge their funders: King's Improvement Science is part of the NIHR CLAHRC South London and comprises a specialist team of improvement scientists and senior researchers based at King's College London. Its work is funded by King's Health Partners (Guy's and St Thomas' NHS Foundation Trust, King's College Hospital NHS Foundation Trust, King's College London and South London and Maudsley NHS Foundation Trust), Guy's and St Thomas' Charity, the Maudsley Charity and the Health Foundation.

This project was supported by the National Institute for Health Research, via Cochrane Infrastructure funding and a Cochrane programme grant to the EPOC Group. The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Systematic Reviews Programme, NIHR, NHS or the Department of Health.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Bekkering 2005

Methods	**Study design:** Cluster-RCT **Unit of allocation**: The physiotherapy practice **Guideline development**: The guidelines used the Dutch method of developing physiotherapy guidelines, and evidence from systematic reviews was sought and used as the basis for the recommendations. If no evidence was available, consensus between experts was obtained.The guidelines were pilot-tested among 100 physiotherapists and reviewed by an external multidisciplinary panel. A survey, to assess barriers, was part of the guideline development process **Guideline implementation tool development**: The face-to-face training sessions were based on interventions that have all been shown to be effective (see below). The content of the strategy was determined on the basis of information about the expected barriers for implementation gathered during the development of the clinical guidelines. Two experts gave advice on the content of the strategy **Theories used:** The authors did not reporting using theory to guide the development of the intervention; they based their intervention on implementation methods known to be effective (interactive education and discussion, feedback, and reminders) **Sample size calculation**: The calculation of sample size was based on a difference of 20% in adherence between the 2 groups, which was considered to be an important difference. It was adjusted for the effect of clustering using an ICC of 0.057 and an estimated cluster size of 5 patients per practice. In total, a sample of 284 patients or 48 practices or both were needed (2-sided α = 0.05, β = 0.20)
Participants	**Participating providers:** Physiotherapists n = 68 practices (113 physiotherapists); Intervention: n = 34 practices (52 physiotherapists); Control: n = 34 practices (61 physiotherapists); 325/6261 = 5.2% of all eligible practices were selected to be invited to participate, of which 257 practices declined participation (79.1%) **Losses to follow-up and withdrawals:** 6 physiotherapists (4 from the intervention group and 2 from the control group) dropped out immediately after randomisation; these were more often working in a solo/duo practice (P = 0.038). 9 physiotherapists from the intervention group did not complete training, and 11 participants also from intervention group (3 did not complete registration, 8 did not include any patients) and 11 participants from the control group (who did not include any patients) were lost to follow-up **Characteristics of healthcare professionals:** Mean (SD) experience (years): Intervention: 15.7 (8.8); Control: 14.1 (8.3) n (%) postgraduate education on low back pain: Intervention: 36 (75.0%); Control: 41 (69.5%) n (%) postgraduate education on chronic pain: Intervention: 0 (0%); Control: 4 (6.8%) **Patients**:patients (n = 500) with non-specific low back pain **Setting**: private physiotherapy practices; n =113 physiotherapists. **Location** (rural/urban): Central part of the Netherlands **Country:** The Netherlands

Interventions	**Aims:** To evaluate the effect on the process of care of an active strategy to implement clinical guidelines on physiotherapy for low back pain **Type of intervention:** Intervention targeting the healthcare professional (educational intervention/tailoring) **Description of guideline tool:** An active strategy to implement the CPGs which consisted of 2 training sessions, each lasting 2½ hours, for groups of 8 - 12 physiotherapists. For each session a preparation time of 2 hours was recommended. The sessions were based on interventions shown to be effective, such as interactive education and discussion, feedback and reminders.The content of the strategy was determined on the basis of information about the expected barriers for implementation gathered during the development of the clinical guidelines.Two experts gave advice on the content of the strategy **Guideline developers:** Royal Dutch Physiotherapy Association (National Physiotherapy guidelines) **Delivery:** Postal delivery of guideline; small-group face-to-face training and reminders; **By whom**: The primary investigator and 1 of 2 additional trainers with adequate clinical experience in the management of low back pain supervised the training sessions **Timing**: The guideline was published in 2001, and the study was conducted between May 2001 and December 2002 **Duration of intervention:** 2 X 2½ hours (+ 2 hours recommended preparation time), 4 weeks between the first and the second session **Control:** All physiotherapists received the clinical guidelines via the standard method of dissemination (by mail) used by the Royal Dutch Society for Physiotherapy. They received the guidelines by mail together with 4 forms: a self-evaluation form to assess whether their current management was consistent with the recommendations contained in the clinical guidelines, 2 forms facilitating discussion with other physiotherapists and general practitioners respectively, and a copy of the Quebec Back Pain Disability Scale. A summary of the clinical guidelines was also provided. At the same time an article about the development of the guidelines was published in a Dutch professional journal for physiotherapists
Outcomes	**Main outcome:** • Adherence to the guidelines **Secondary outcome:** • Costs (reported in Hoeijenbos 2005) • Quality of life (assessed with the EQ-05 and reported in Hoeijenbos 2005) **Follow-up:** 4 weeks after randomisation (adherence outcomes), 12 months (cost outcomes)
Notes	**Ethical approval and informed consent obtained (yes/no):** Yes **Conflict of interest:** None declared **Funding:** the Ministry of Health, Welfare and Sports

Risk of bias

Bias	Authors' judgement	Support for judgement

Random sequence generation (selection bias)	Low risk	p. 108, Col. 1, Para. 2 "Block randomisation (blocks of four practices) was carried out after pre-stratification for the work setting (solo/duo practices versus group practices). A statistician, who was not involved in this trial, drew up an allocation schedule using a computerised random number generator."
Allocation concealment (selection bias)	Low risk	The primary investigator (GEB), without any knowledge of the practices, listed the practices alphabetically according to the name of their street address, and subsequently assigned them to the intervention or control group using the allocation schedule
Blinding of participants and personnel (performance bias) All outcomes	High risk	**Outcome group:** adherence to guidelines The participating physiotherapists could not be blinded to the intervention. The physiotherapist selected a maximum of 10 consecutive patients for the study. High risk for performance bias
Blinding of outcome assessment (detection bias) All outcomes	Low risk	p.108, Col.1, Para.5 "Two reviewers independently assessed the registration form using the algorithm without being aware of the group allocation. In total, four reviewers assessed the forms. Before the final scoring five cases were used for a pilot assessment and these were blinded again afterwards. In case of disagreement between the two reviewers, a method was used to discuss and resolve the disagreement by consensus. If the disagreement persisted, a third reviewer made the final decision."
Baseline characteristics similar	Unclear risk	Physiotherapists in the intervention group were slightly older (P = 0.011), but there were no other differences between the 2 groups. 500 patients were included
Baseline outcome measures similar	Unclear risk	The intervention group had a higher quality-of-life score, 0.6730 (SD 0.2042) compared with the control group 0.6134 (SD 0.2661)

Bekkering 2005 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	High risk	37/52 intervention physiotherapists (71. 2%) and 48/61 control physiotherapists (78.7%) remained in the study at follow-up
Selective reporting (reporting bias)	Low risk	Results reported for all outcomes listed in the Methods section
Other bias	Low risk	No evidence of other risk of bias

Daucourt 2003

Methods	**Study design:** Cluster-RCT **Unit of allocation:** The wards **Guideline development**: The CCECQA established the guidelines in collaboration with a regional working group and a national review group. The method combined a comprehensive review of the literature and expert consensus **Guideline implementation tool development**: No information **Theories used:** No information **Sample size calculation**: The expected prevalence used for the sample size calculation was the rate of test ordering of "TSH only." With a probability of 0.05, an error of 0.20, an expected rate of test ordering of "TSH only" in the control group of 0.50, a minimal increase in test ordering of the "TSH only" rate of 0.10, an ICC of 0.25 and an estimated average number of thyroid function tests by cluster (ward) of 40
Participants	**Participating healthcare professionals:** Physicians; n = 704; Intervention (Dual Intervention Group): n = 346; Control Group (guideline only) n = 358). Note: 2 study arms (Order Form Group, n = 339; Pocket Card Group, n = 369) were not included in this review Ward specialty Medicine : Dual intervention: 63; Control: 76; Emergency: Dual intervention: 2; Control: 0; Psychiatry: Dual intervention: 34; Control: 24 Surgeon: Dual intervention: 1; Control: 0 Prescriber status Senior: Dual intervention: 53; Control: 57; Junior: Dual intervention: 43; Control: 40; Unknown: Dual intervention: 4; Control: 3 Indication of test ordering* Test of thyroid dysfunction: Dual intervention: 61; Control (guideline only): 59 Therapeutic tests: Dual intervention: 23; Control (guideline only): 23 Other pathologic test: Dual intervention: 16; Control (guideline only): 18 **Losses to follow-up and withdrawals**: 52 tests were not accounted for **Patients**: Patients with symptoms indicating a need for a thyroid function test **Setting**: 6 volunteer general hospitals all receiving residents: 2 middle-sized hospitals in the second and third largest towns in Aquitaine (Pau hospital (535 beds) and Bayonne hospital (494 beds)), 2 small-sized hospitals (Bergerac hospital (171 beds) and Bouscat hospital (90 beds)) and 2 psychiatric hospitals (Charles Perrens hospital (904 beds) and Cadillac hospital (541 beds)) **Location** (rural/urban): Aquitaine, in South-West France

Daucourt 2003 (*Continued*)

	Country: France
Interventions	**Aims:** To compare the (independent) and combined effectiveness of 2 implementation interventions (a memorandum pocket card and a test request form) of guidelines for ordering thyroid function tests **Type of intervention:** interventions targeting the healthcare professional **Type of guideline tool:** a Memorandum Pocket Card (MPC) and a Test Request Form (TRF).The TRF replaced the former order sheet. It was a 2-by-2 grid with coloured boxes (white, grey, black). Orders were made by checking the box at the intersection between test and clinical situations. Boxes corresponding to inappropriate test ordering were shaded, therefore making ordering impossible.The physician could overrule this by writing down the order at the bottom of the sheet. The MPC summarised the recommendations according to the various clinical or therapeutic situations requiring thyroid exploration. It was small enough for physicians to keep it in their coat pocket and to consult it before prescribing thyroid function test **Guideline developers:** The CCECQA established such guidelines in collaboration with a regional working group and a national review group **Delivery:** Paper-based interventions (and face-to-face meeting) **Timing**: Unclear **Duration of intervention:** 4 weeks **Control:** Physicians in all groups received guidelines and were invited to a local information meeting
Outcomes	**Main outcome:** • Proportion of thyroid function test ordering in accordance with the guidelines (Guideline Conformity Rate (GCR)) **Follow-up:** 4 weeks after guideline implementation
Notes	**Ethical approval and informed consent obtained (yes/no):** No information **Conflict of interest:** No information **Funding:** Supported in part by the Agence Nationale de l'Accreditation et de l'Evaluation en Santé (ANAES)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	p. 433, Col. 2, Para. 1 "Randomization was performed by the CCECQA using a random number table."
Allocation concealment (selection bias)	Low risk	Cluster-RCT .
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	**Outcome group:** proportion of thyroid-function test ordering in accordance with the guidelines It was not explicitly stated if the healthcare professionals ordering the tests were blinded to the intervention

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	p. 433, Col. 2, Para. 3 "A standardized collection grid was prospectively filled in by a research assistant in each hospital for all consecutive thyroid function tests ordered during the collection period. No information on blinding."
Baseline characteristics similar	Unclear risk	Gender differed according to the intervention groups: the proportion of women was 65% in the dual intervention group, 63% in the order-form group, 73% in the pocket card group and 61% in the control group (P < 0.01). The mean patient age was 67 years (SD 20 years) in the dual intervention group, 64 years (SD 20 years) in the order-form group, 70 years (SD 21 years) in the pocket card group, and 66 years (SD 17 years) in the control group (P < 0.01) . No ward/healthcare professional characteristics provided
Baseline outcome measures similar	Unclear risk	No baseline measure of outcome
Incomplete outcome data (attrition bias) All outcomes	Low risk	Indication of test ordering unknown for 52 (3.1%) patients (total n = 1464)
Selective reporting (reporting bias)	Low risk	No evidence of selective outcome reporting
Other bias	Low risk	No evidence of other risk of bias

Fine 2003

Methods	**Study design:** Cluster-RCT **Unit of allocation**: Groups of physicians **Guideline development**:The medical practice guideline developed for this project was based on a review of the evidence of the time to reach clinical stability, and consensus of an 8-member national guideline panel. The guideline was reviewed by clinical opinion leaders at each study site, and was approved for local use by the relevant utilisation management department. The final guideline consisted of explicit clinical criteria to define stability for conversion from intravenous to oral antibiotic therapy and for hospital discharge **Guideline implementation tool development**: No information **Theories used:** No information **Sample size calculation**:This study was designed with 80% power to detect a 1-day decrease in length of stay from an assumed baseline of 7.2 days. The sample size was adjusted for the clustering on physician group (22), assuming an average of 3.5 patients per group and an ICC of 0.1
Participants	**Participating healthcare professionals:** 116 groups of physicians who were likely to treat patients with community-acquired pneumonia: Intervention: 277 physicians (57 groups); Control: 268 physicians (59 groups) **Characteristics of healthcare professionals:** Age (years): Intervention: 47 ± 11; Control: 46 ± 11, P = 0.35 Female: Intervention: 45 (18); Control: 57 (24) , P = 0.09 Medical specialty, P = 0.14 Generalists: Intervention: 190 (73); Control: 192 (79) Pulmonary specialist: Intervention: 19 (7); Control: 19 (8) Other specialists: Intervention: 50 (19); Control: 31 (13) **Patients**: Patients treated by a participating physician and who had a documented treatment plan for hospital-acquired pneumonia, and a chest radiograph report consistent with a new pulmonary infiltrate; Intervention: n = 283; Control: n = 325. Note: only 40% of eligible patients were enrolled **Setting**: 7 non-profit hospitals: 1 university teaching hospital (site A); 3 community teaching hospitals (sites B,C and D); 3 community non-teaching hospitals (sites E.F and G) **Location** (rural/urban): Pittsburg, Pennsylvania **Country:** USA
Interventions	**Aims:** To determine whether implementation of an evidence-based guideline would reduce the duration of intravenous antibiotic therapy and length of stay for patients hospitalised with pneumonia **Type of intervention:** Education (detail sheet with treatment recommendations) **Type of guideline tool:** An educational mailing delivered to physicians and a daily assessment of patient stability that was coupled with a multifaceted strategy to implement the project guideline once a patient met criteria for stability. A detail sheet was placed in the patient's medical record once a patient met guideline criteria for stability, a follow-up recommendation to the attending physician, and an offer to arrange follow-up home nursing care. One of the 3 site-specific detail sheets promoting the recommended action(s) (i.e. conversion from intravenous to oral antibiotic therapy only, conversion and hospital discharge, or hospital discharge only) was placed in the physician progress notes section of each patient's chart immediately following the determination of the

	corresponding type(s) of stability. At this time, the research nurse telephoned or directly approached the patient's attending physician to state that the patient met guideline criteria for conversion to oral antibiotic therapy or hospital discharge (or both); to indicate that the detail sheet had been placed in the medical record and review its content with the physician; and to offer to take a verbal order for oral antibiotic therapy and make arrangements for home nursing care **Guideline developers:** Researchers who were part of the PORT group **Delivery:** Paper-based detail sheets/treatment recommendations; nurse telephone reminder **Timing**: Once the patient treated with intravenous antibiotics had been deemed to be in a stable condition according to the guidelines, the intervention tool was delivered. The CPG was delivered as part of the educational mailing 1 month before recruitment of patients started **Duration of intervention:** 12 months (patients were recruited between 1 February 1998 and 31 March 1999) **Control:** The educational mailing was delivered to physicians in both study arms during the month before patient recruitment began. The control group receive a practice guideline alone. This mailing included a cover letter signed by the hospital's utilisation management director describing the rationale for the guideline and a written version of the guideline
Outcomes	**Main outcomes:** • Duration of intravenous antibiotic therapy • Length of index hospital stay • Time to stability (for conversion to oral antibiotics and for discharge) **Secondary outcomes:** • All-cause mortality (data retrieved from records) • Pneumonia-related mortality (data retrieved from registers) • Medical complications (data retrieved from medical records) • Rehospitalisation rates (interview assessed) • Functional status (subgroup only, results not included in this review) • Time to return to usual activities (subgroup only, results not included in this review) • Patient satisfaction with care **Follow-up:** secondary outcomes were assessed 30 days after the index hospitalisation
Notes	**Ethical approval and informed consent obtained (yes/no):** Yes **Conflict of interest:** None declared **Funding:** The Agency for Healthcare Research and Quality, Rockville, Maryland, and the National Institute of Allergy and Infectious Diseases (HS08282), Bethesda, Maryland. Dr Fine was also supported in part as a Robert Wood Johnson Foundation Generalist Physician Faculty Scholar and by a Career Development award from the National Institute of Allergy and Infectious Diseases

Risk of bias

Bias	Authors' judgement	Support for judgement

Fine 2003 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	No information
Allocation concealment (selection bias)	Unclear risk	The groups of physicians that were randomised to intervention and control group were at the same location
Blinding of participants and personnel (performance bias) All outcomes	High risk	**Outcome group:** duration of intravenous antibiotic therapy " Because of the nature of the intervention, physicians and research nurses could not be blinded to their treatment assignments. Patients were not informed of their physicians' treatment assignment"
Blinding of participants and personnel (non-objective outcomes)	Unclear risk	**Outcome group:** hospitalisations, functional status At the 30-day telephone interview, patients or their proxy respondents were queried about subsequent hospitalisations (patient self-report). Functional status was reassessed with the SF-12 (18) for patient respondents only
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	**Outcome group**: duration of intravenous antibiotic therapy; length of stay for the index hospitalisation. Data retrieved from registers, but unclear by whom
Baseline characteristics similar	Low risk	Baseline characteristics similar (Table 2)
Baseline outcome measures similar	Unclear risk	No baseline measures of outcome
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	There were 25 post-enrolment exclusions (providers) in each study arm, and 10 in-hospital study withdrawals (4 intervention and 6 control)
Selective reporting (reporting bias)	Low risk	Results reported for all outcomes listed in the Methods section
Other bias	Low risk	No evidence of other risk of bias

Shah 2014

Methods	**Study design:** 2 separate studies: 1 a population-based multicentre cluster-RCT, and the other an embedded C-RCT including a subgroup of these practices **Unit of allocation:** family practices **Guideline development**: Candadian Diabetes Association (CDA) updated their 2008 guideline: reviewed the literature and graded the evidence as well as the applicability of evidence, and subjected the revised draft guideline to external peer review **Guideline implementation tool development**: The CDA formed a Dissemination and Implementation Committee to create a guideline implementation strategy. The first component of this strategy was aimed at improving adherence with the recommendations for cardiovascular disease screening and treatment for people with diabetes. The strategy highlighted the identification of diabetic patients at high risk for cardiovascular events, treatment targets and methods for vascular protection, and the selection of patients and methods for coronary artery disease screening. The toolkit was created for the CDA by clinical experts including family physicians, endocrinologists, and other healthcare professionals, with guidance from clinicians with expertise in knowledge translation and implementation **Theories used:** the toolkit was developed without a specific quality improvement or educational theory to guide its content or delivery **Sample size calculation**: *Administrative data study*: an administrative data base of the entire population aged $\geq$ 40 years with diagnosed diabetes in Ontario, which was more than 900,000 people; the study had .95% power to detect an unadjusted absolute difference of at least 0.4% in a dichotomous primary outcome, using an α-error of 0.05. Power was reduced after adjustment for baseline differences and for clustering, but remained sufficient to detect very small differences in outcomes *Cinical data study:* The sample size for the clinical data study was based on an absolute 10% difference in statin prescription rates between intervention and control patients, a threshold similar to the median effect size found in a systematic review of printed educational materials; with 80% power and an α-error of 0.05, a sample size of 796 per group with 20 patients per practice was required
Participants	**Participating providers**: *Administrative data study*: all family practices in Ontario; Intervention: 2008 practices; Control: 1999 practices, number of healthcare professionals not reported; *Cllincal data study:* Intervention: 40 practices; Control: 40 practices **Practice type** *Administrative data study***:** Solo: Intervention: 1125 (56.0); Control: 1155 (57.8); Group: Intervention: 883 (44.0); Control: 844 (42.2) Rural practice: Intervention:190 (9.5); Control:160 (8.0) Diabetes patient volume: < 100; Intervention: 760 (37.8), Control: 708 (35.4) 100 to < 200: Intervention: 742 (37.0), Control: 788 (39.4) 200+ : Intervention: 506 (25.2), Control: 503 (25.2) *Clinical data study*:**:** Solo: Intervention: 16 (40.0), Control: 22 (55.0); Group: Intervention: 24 (60.0), Control: 18 (45.0) Rural practice ; Intervention: 2 (5.0), Control: 1 (2.5) Diabetes patient volume < 100; Intervention:7 (17.5), Control: 4 (10.0) 100 to 200: Intervention: 23 (57.5), Control: 15 (37.5) 200+ : Intervention:10 (25.0), Control: 21 (52.5)

	Patients: *Administrative data study:*all diabetic patients > 40 years of age in Ontario; Intervention: n = 467,713; Control: 466,076 *Clinical data study:*n of participating patients: Intervention: n = 795; Control: 797 patients with diabetes aged > 18 years who were seen in the office at least once between July 2009 and March 2010, and who fulfil the Clinical Practice Guidelines' definition of being at "high risk for CV events": Exclusion criteria: Residents of long-term care facilities. Individuals who could not be assigned to a family practice were excluded **Characteristics of participants:** *Administrative data study*: Age, mean (SD): Intervention: 64.3 (12.4); Control: 64.2 (12.4) Male: Intervention: 246,741 (52.8); Control: 245,204 (52.6) Diabetes type: no information Diabetes duration, yrs: < 2 Intervention: 76,547 (16.4), Control: 77,011 (16.5) yrs 2 to < 5: Intervention:112,509 (24.1), Control: 112,543 (24.1) yrs 5 to < 10: Intervention: 127,375 (27.2), Control: 126,831 (27.2) yrs 10+: Intervention: 151,282 (37.3), Control: 149,691 (32.1) Previous cardiovascular disease: Intervention: 30,108 (6.4), Control: 29,801 (6.4) Hypertension; Intervention:318,015 (68.0), Control: 317,941 (68.2) Clinical data study: Age, mean (SD), y Intervention:65.9 (10.3), Control: 65.5 (10.6) Male: Intervention: 412 (51.8), Control: 429 (53.8) Diabetes type: Type 1 14 (1.8) 11 (1.4); Type 2 781 (98.2) 786 (98.6) Diabetes duration, y: <2 Intervention: 145 (18.2), Control: 120 (15.1) 2-5 Intervention:196 (24.7), Control: 183 (23.0) 5-10 Intervention: 195 (24.5), Control: 214 (26.9) 10+ Intervention: 252 (31.7), Control: 275 (34.5) Previous cardiovascular disease Intervention: 317 (39.9), Control: 331 (41.5) Hypertension: Intervention:754 (94.8), Control: 767 (96.2) **Losses to follow-up and withdrawals**: No information about the clinical study (none from the administrative study) **Setting**: Family practices **Location** (rural/urban):urban and rural Ontario areas **Country:** Canada
Interventions	**Aims:** To evaluate the effectiveness of an educational toolkit focusing on cardiovascular disease screening and risk reduction in people with diabetes **Type of intervention:** Passive **Type of guideline tool:** printed educational materials (CVD toolkit):The cardiovascular disease toolkit was a collection of printed educational materials, packaged in a brightly-coloured box with CDA branding, sent to Canadian family physicians. The contents included an introductory letter from the Chair of the practice guidelines' Dissemination and Implementation Committee; an eight-page summary of selected sections of the practice guidelines targeted towards family physicians; a four-page synopsis of the key guideline elements pertaining to cardiovascular disease risk; a small double-sided laminated card with a simplified algorithm for cardiovascular risk assessment, vascular protection strategies, and screening for cardiovascular disease; and a pad of tear-off sheets for patients with a cardiovascular risk self-assessment tool and a list of recommended

	risk reduction strategies **Guideline developers:** Canadian Diabetes Association (CDA) **Delivery:** By mail **Timing**: Delivered simultaneously with the updated guideline **Duration of intervention:** One-off **Control:** Control providers received the Canadian Diabetes Association newsletter, which included the revised GL **Follow-up time:** 10 months
Outcomes	**Main outcomes:** • Death or non-fatal MI (administrative data study) • Prescription for statin (clinical data study) **Other (secondary) outcomes:** • Clinical events (admin study): all-cause death, MI, MI or unstable angina, stroke, stroke or TIA, and other composite outcomes • CAD assessment (admin study): electrocardiogram, cardiac stress test and nuclear imaging, coronary angiography, coronary revascularisation processes, cardiology or internal medicine visits • Medication initiation (admin study): ACEI/ARB, statin, glucose-lowering drug, insulin, and nitrate • Proportion of patients prescribed an angiotensin converting enzyme inhibitor or angiotensin blocker (clinical study) • Various intermediate measures (e.g. HbA1c, BP etc) (clinical study) • Clinical inertia.(clinical study)
Notes	**Ethical approval and informed consent obtained (yes/no):** The study was approved by the Research Ethics Board of Sunnybrook Health Sciences Centre, Toronto, Ontario **Conflict of interest:** BRS was a member of the Guideline Dissemination and Implementation Committee and the National Research Council of the Canadian Diabetes Association (CDA) at the time of the study. OB was a member of the Executive of the Clinical and Scientific Section and the Guideline Dissemination and Implementation Committee of the CDA at the time of the study. CHYY is currently Chair of the Guideline Dissemination and Implementation Committee of the CDA. MMM has served as an Advisory Board member for the following pharmaceutical companies: Astra Zeneca, Bristol-Myers Squibb, Eli Lilly and Company, Glaxo Smith Kline, Hoffman La Roche, Novartis, Novo Nordisk, and Pfizer. JAP has served as both a guest academic editor and a reviewer for PLOS Medicine **Funding:** The study was funded by an operating grant from the Canadian Institutes for Health Research (CIHR) and the Heart and Stroke Foundation of Canada. BRS receives salary support from the CIHR, and previously received support from the Canadian Diabetes Association. The Institute for Clinical Evaluative Sciences (ICES) is a non-profit research institute funded by the Ontario Ministry of Health and Long-Term Care (MOHLTC)

Risk of bias

Bias	Authors' judgement	Support for judgement

Random sequence generation (selection bias)	Low risk	"..family practices in the province of Ontario were allocated 1:1 into the intervention or control group using random number sequences generated by SAS version 9. 3 (SAS Institute Inc.), stratified by the 14 health regions into which responsibility for health care delivery in Ontario is divided. We randomly selected practices from each of the intervention and control arms, and randomly selected one physician from each practice. Each selected physician was contacted, and if willing to participate in the study,we randomly selected 20 diabetic patients who had visited the physician during the study period, and who fulfilled the CDA's definition of being at "high risk for cardiovascular eventsPatients were selected using random number sequences generated by SAS version 9.3 (SAS Institute). Their charts were reviewed by a trained and experienced registered nurse, blinded to treatment allocation, who abstracted relevant data into a computerized data collection template"
Allocation concealment (selection bias)	Low risk	See above
Blinding of participants and personnel (performance bias) All outcomes	Low risk	In the clinical study the family physicians were aware they were part of an intervention trial, but data were retrospectively retrieved
Blinding of participants and personnel (non-objective outcomes)	Low risk	Patients did not know they were part of a trial, and data were retrospectively retrieved
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Objective outcomes and data (prescription of statins) retrieved from patient records
Baseline characteristics similar	High risk	Patient characteristics were similar in the clinical study. However, there were important differences in the type of practices between groups: more then double the proportion of clinics with 200+ diabetes patients, and greater proportion of solo practices in the control group, compared to the intervention group

Baseline outcome measures similar	Low risk	No baseline measure of outcomes in the clinical data study, but baseline levels of statins prescribed reported in the admin study
Incomplete outcome data (attrition bias) All outcomes	Low risk	The clinical study data were collected from patient records
Selective reporting (reporting bias)	Unclear risk	Some of the outcomes listed in the trial protocol (i.e. BMI and waist circumference) were not reported in the paper
Other bias	Unclear risk	Endocrinologist in Ontario also received the intervention tool, but were not part of the study. However, 18% of the diabetes patients in Ontario were treated by both GPs and endocrinologists, which may have biased the results

ACEI/ARB: angiotensin converting enzyme inhibitor/angiotensin receptor blocker
BMI: body mass index
BP: blood pressure
CCECQA: Committee for Co-ordinating Clinical Evaluation and Quality in Aquitaine
C-RCT: cluster-randomised controlled trial
HbA1c: glycosylated haemoglobin
ICC: intraclass correlation coefficient
MI: myocardial infarction
PORT: Pneumonia Patient Outcomes Research Team
SD: standard deviation
TIA: transient ischaemic attack

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Allegranzi 2013	Evaluation of WHO hand-hygiene guideline kit. Ineligible study design
Baker 2001	The guideline implementation tools were not developed by existing guideline producers
Bosch 2014	Protocol of a cluster-RCT. Control will not receive guideline only
Chan 2013	One of the authors (not an existing guideline developing body) developed both the guideline and the tool. Comparison was not guideline only

(*Continued*)

De Beurs 2015	Eligible intervention and study design, but ineligible outcomes
Eccles 2002	C-RCT: Tools not developed by existing guideline developers
Eccles 2007	C-RCT.Tools not developed by existing guideline developers
Flottorp 2002	Tools not developed by existing guideline developers
Fretheim 2006	Tools not developed by existing guideline developers
Overbeek 2010	Tool not developed by existing guideline developers
Robling 2002	The tool was not developed by existing guideline producers
Rood 2005	Tools not developed by existing guidelines developers
Rycroft-Malone 2012	Tools not developed, but supported by, the guideline developers (RCN/RCA)
Witt 2004	Tool not developed by existing guideline developers

Characteristics of studies awaiting assessment *[ordered by study ID]*

Maximov 2012

Methods	Study design: C-RCT
Participants	Healthcare providers: 16 general practitioners/clusters who completed the trial (10 from the intervention group, 6 from the usual-care group) Patients: 92 patients with knee and hip osteoarthritis (63 in the intervention group, 29 in the usual-care group)
Interventions	1-day didactic educational meeting, provision of the printed guideline and patient brochures
Outcomes	Patient's outcomes investigated: WOMAC pain and stiffness scores, body mass index and self-reported treatment received (oral NSAID, physical exercise, alternative treatment) at 6 and 12 months after the intervention
Notes	Conference abstract only

Van Driel 2007

Methods	Study design: C-RCT
Participants	Healthcare providers: general practitioners in Flanders, Belgium
Interventions	Quality circles: self-led meetings using material introduced to the group moderator by a member of the research team

Van Driel 2007 (*Continued*)

Outcomes	Adherence to guidelines
Notes	

Characteristics of ongoing studies *[ordered by study ID]*

Salbach 2014

Trial name or title	
Methods	C-RCT
Participants	Healthcare providers: 20 rehabilitation hospitals/inpatient stroke rehabilitation teams Patients: people suffering from stroke
Interventions	Multicomponent intervention: 2 clinician facilitators per hospital attended a 2-day workshop to receive training to apply a treatment guideline (18 recommendations) and identify barriers and strategies for implementation. They also received copies of the treatment recommendations, treatment protocols, presentation slides, pocket cards, and protected time weekly to facilitate implementation over a 10-week period Control condition: Copies of the treatment recommendations (the guideline), a video, and a handbook on using outcome measures
Outcomes	Rate of implementation of guideline recommendations
Starting date	
Contact information	
Notes	Conference abstract only.

Te Boveldt 2011

Trial name or title	
Methods	Study design: C-RCT
Participants	Healthcare providers: 6 oncology outpatient clinics of hospitals in the South-eastern region of the Netherlands, with 3 hospitals in the intervention and 3 in the control condition
Interventions	A Short Message Service with Interactive Voice Response (SVSIVR) will be used with the aim to improve pain reporting, pain measurement and adequate pain therapy for people with cancer. The intervention also includes training of professionals (medical oncologists, nurses, and general practitioners)
Outcomes	Pain reporting, pain measurement, adequate pain therapy and pain intensity
Starting date	

Te Boveldt 2011 (*Continued*)

Contact information	E-mail: n.teboveldt@anes.umcn.nl Adress: Department Anesthesiology, Pain and Palliative Medicine, Radboud University Nijmegen Medical Centre (RUNMC), Nijmegen, 6500 HB, The Netherlands
Notes	Protocol only

DATA AND ANALYSES

This review has no analyses.

ADDITIONAL TABLES

Table 1. Guideline development process

Author Year Targeted behaviour	Guideline developers	Literature review	Critical appraisal	Consensus processes	Key stakeholder involvement	Barriers/facilitator assessment
Bekkering 2005 Targeted behaviour: management of non-specific low back pain Number of recommendations: 4 main recommendations	The Royal Dutch Physiotherapy Association.	CPGs[2] were constructed on the basis of the phases of the physiotherapy process, using the Dutch method of developing physiotherapy guidelines, and evidence from systematic reviews were identified through searching electronic databases	Not mentioned but probably included in the Dutch method of developing CPGs	Based on scientific evidence. If no evidence was available, consensus between experts was obtained	The CPGs were pilot-tested among 100 physiotherapists and reviewed by an external multidisciplinary panel	Barriers to change were assessed through a survey as part of the CPG development process
Daucourt 2003 Targeted behaviour: appropriate thyroid function testing Number of recommendations: not reported	The Committee for Co-ordinating Clinical Evaluation and Quality in Aquitaine (CCECQA) developed guidelines in collaboration with a regional working group and a national review group	The CPG developers conducted a comprehensive review of the literature	-	CPG[3] development involved an expert consensus process.	-	-
Fine 2003 Targeted behaviour: appropriate duration of intravenous	Researchers who were part of the Pneumonia Patient Outcomes Research	The CPG was based on a review of the medical literature, and empiric evi-	-	The CPG development process involved the consensus of an 8-member na-	The guideline was reviewed by clinical opinion leaders at each study	-

Table 1. Guideline development process (*Continued*)

antibiotic therapy for treatment of pneumonia **Number of recommendations: a 2-step recommendation**	Team (PORT)	dence on time to reach clinical stability		tional guideline panel	site, and was approved for local use by the relevant utilisation management department	
Shah 2014 **Targeted behaviour: management of cardiovascular risk factors and outcomes of cardiovascular disease in people with diabetes** **Number of recommendations: no information**	Canadian Diabetes Association (and Expert Committee members)	Expert Committee members evaluated the relevant literature, and guidelines were developed and initially reviewed by the Expert Committee	After formulating new recommendations or modifying existing ones based on new evidence, each recommendation was assigned a grade from A through D	Based on scientific evidence/review of the literature	A draft document was circulated nationally and internationally for review by numerous stakeholders and experts in relevant fields. Subsequently, a panel of 6 methodologists, who were not directly involved with the initial review and assessment of the evidence, independently reviewed each recommendation, its assigned grade and supportive citations	-

[1] Khunti 1998. Development of evidence-based review criteria for the management of patients with depression in general practice. No published version of the guideline found.

[2] Bekkering 2003. Dutch physiotherapy guidelines for low back pain.

[3] Saillour Glénisson 2001. Guidelines for thyroid function tests in adults.

[4] Shah 2014. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee: Canadian Diabetes Association 2008 clinical practice guidelines for the prevention and management of diabetes in Canada.

Table 2. Guideline tool development and delivery

Author Year	Delivery of the intervention	Theoretical models/ frameworks used	Evidence base	Targeted to barriers	Key stakeholder involvement
Bekkering 2005 **Type of intervention: simple, but multicomponent; active only** **Intervention target: the healthcare professional** **Targeted behaviour: management of nonspecific low back pain**	**Mode:** face-to-face **Provider**: The primary investigator and 1 of 2 additional trainers with adequate clinical experience in the management of low back pain supervised the training sessions	-	"The sessions were based on interventions that have all been shown to be effective, such as interactive education and discussion, feedback, and reminders".[1,2,3,4,5]	The content of the strategy was determined on the basis of information about the expected barriers for implementation gathered during the development of the CPGs	2 experts gave advice on the content of the strategy
Daucourt 2003 **Type of intervention: multicomponent; passive only** **Intervention target: the healthcare professional** **Targeted behaviour: appropriate thyroid function testing**	**Mode:** Paper-based materials **Provider:** none	-	"Among the clinical guideline diffusion strategies, the most effective are feedback, reminders, academic detailing and financial incentives[1,2,4,5] Administrative procedures such as the implementation of test request forms have also proved effective."	-	-
Fine 2003 **Type of intervention: single; active + passive** **Intervention target: the healthcare professional** **Targeted behaviour: appropriate duration of intravenous antibiotic therapy for treatment of pneumonia**	**Mode:** Paper-based material (detail sheets/treatment recommendations in patient records) and telephone reminder **Provider**: nurse delivered telephone reminder	-	"The multifaceted guideline dissemination strategy consisted of interventions of proven benefit, including real-time physician reminders" [1,6,7,8]	-	-

Table 2. Guideline tool development and delivery (*Continued*)

Shah 2014 **Type of intervention: passive** **Intervention target: family physicians (and diabetes patients at high risk of cardiovascular disease)** **Targeted behaviour: management of cardiovascular risk factors and outcomes of cardiovascular disease in people with diabetes**	**Mode:** printed educational materials **Targeting the family physician**: The cardiovascular disease toolkit was a collection of printed educational materials, packaged in a brightly-coloured box with CDA branding, sent to Canadian family physicians. The contents included an introductory letter from the Chair of the practice guidelines' Dissemination and Implementation Committee; an 8-page summary of selected sections of the practice guidelines targeted towards family physicians; a 4-page synopsis of the key guideline elements pertaining to cardiovascular disease risk; a small double-sided laminated card with a simplified algorithm for cardiovascular risk assessment, vascular protection strategies, and screening for cardiovascular disease, and a pad of tear-off sheets for patients with a cardiovascular risk self-as-	The implicit theory behind its development was that the guidelines were too long and complex to be easily incorporated into clinical practice, so the toolkit aimed to simplify the information, tailor it towards clinical practice, and provide explicit actionable recommendations	"The literature has demonstrated that the benefits of printed educational interventions are, at best, modest. A systematic review of methods to improve practice guideline adherence demonstrated an absolute improvement of 8% for educational materials. A more recent Cochrane review found that printed educational materials led to a median absolute improvement in performance of only 2% (25). Studies of printed materials specifically tied to clinical practice guidelines also showed modest benefits. A small English study randomised 42 family physicians to receive an algorithm for monitoring and treatment of hypertension of diabetic patients based on practice guidelines, but found no difference in blood pressure control between the intervention and control groups. However, some processes of care were slightly	-	The toolkit was created for the CDA by clinical experts including family physicians, endocrinologists, and other healthcare professionals, with guidance from clinicians with expertise in knowledge translation and implementation

Table 2. Guideline tool development and delivery (*Continued*)

	sessment tool and a list of recommended risk reduction strategies **Provider:** NA[13]		improved: patients in the intervention group were prescribed higher doses of antihypertensive medications, and had more physician visits to monitor blood pressure. In a larger Canadian study, family physicians were randomised to receive a 1-page summary of a 3-year-old practice guideline on anti-anginal therapy from the local medical governing body. No differences were noted in prescription of β-blockers, antiplatelet agents, or lipid-lowering drugs between groups in the 7000 patients reviewed" [9,10,11,12]		

[1]Bero 1998 Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings.
[2]Davis 1995 Changing physician performance. A systematic review of the effect of continuing medical education strategies.
[3]Wensing 1998 Implementing guidelines and innovations in general practice: which interventions are effective?
[4]Grimshaw 1995 Developing and implementing clinical practice guidelines.
[5] Davis 1997. Translating guidelines into practice. A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines.
[6]Murrey 1992 Implementing clinical guidelines: a quality management approach to reminder systems.
[7]Grimshaw 1993. Effect of clinical guidelines on medical practice: a systematic review of rigorous evaluations.
[8]Weingarten 2000. Translating practice guidelines into patient care: guidelines at the bedside.
[9]Grimshaw 2006. Towards evidence-based quality improvement: evidence (and its limitation) of the effectiveness of guideline dissemination and implementation strategies 1966-1998.
[10]Giguère 2012. Printed educational materials: effects on professional practice and healthcare outcomes.
[11]Bebb 2007. A cluster randomised controlled trial of the effect of a treatment algorithm for hypertension in patients with type 2 diabetes.
[12] Beaulieu 2004. Drug treatment of stable angina pectoris and mass dissemination of therapeutic guidelines: a randomized controlled trial.
[13]Not applicable

Table 3. Intervention components

Author Year	Tailoring	Feedback	Educational outreach/ Academic detailing/ Small group discussions	Reminders (paper, electronic, telephone)	Decision support tools	Other (test order forms, supportive materials etc.)
Bekkering 2005	The content of the strategy was determined on the basis of information about the expected barriers for implementation gathered during the development of the clinical guidelines	-	2 interactive training sessions, each lasting 2½ hours, for groups of 8 - 12 physiotherapists (including feedback on current management and reminders). For each session a preparation time of 2 hours was recommended	-	-	-
Daucourt 2003	-	-	-	Pocket memorandum card.	-	Test request form.
Fine 2003	-	-	-	Paper-based detail sheet/ treatment recommendations put into the patient's record + real-time nurse telephone reminder	-	-
Shah 2014	-	-	-	-	-	Printed educational materials

Table 4. Results: Other outcomes

Author Year	Clinical outcomes; Medical complications	Quality of life Satisfaction with care	Mortality	Healthcare resource use (including medications prescribed)	Costs
Bekkering 2005	-	*Quality of Life (assessed with the EQ-5D[1]), mean (SD):* BL: Inter-	-	-	*Mean annual cost (Euros) per patient (SD)*: Direct cost[2]: Intervention: 374

Table 4. Results: Other outcomes (*Continued*)

		vention: 0.6730 (0. 2042); Control: 0. 6134 (0.2661), P = 0.006. At 6 weeks: Inter- vention: 0.7778 (0. 1978); Control: 0. 7497 (0.2316) At 12 weeks: Inter- vention: 0.8141 (0. 1988); Control: 0. 7873 (0.2210) Note: results for 26 and 52 weeks re- ported graphically			(437). Control: 449 (572). *The costs (Euro) of releasing a new guideline for low back pain to 18,000 physiotherapists*: Intervention (active strategy): 87,416 Control (passive strategy): 63,101
Daucourt 2003	-	-	-	-	Cost paper awaits translation
Fine 2003	*In-hospital medical complications, number (%):* In- tervention:157 (55); Control: 206 (63), P = 0.04 *Functional status*[3] SF-12 phys- ical health composite score: Intervention:45 ± 7, n = 181; Control: 45 ± 7, n = 223; P = 0.71 SF-12 mental health composite score: Intervention: 45 ± 6; Control: 45 ± 7, P = 0.71	*Patient satisfaction with care*[4] , number (%): Not satisfied with overall care: Intervention: 12 (5.3), n = 228; Control: 11 (4.0), n = 273, P = 0. 67 Be- lieved length of stay was too short: Intervention: 59 (26.1); Control: 54 (20.2), P = 0.16 *Return to usual activities*[5],Hazard ratio (95% CI): Nonworkers: 1. 09 (0.83 to 1.43), P = 0.55 Workers: 0.85 (0.54 to 1.35); P = 0.49 *Return to work* (workers) 0.99 (0.63 to 1.58), P = 0.98	*Mortality*[6] *all-cause, number (%):* Intervention: 22 (8), n = 283; Control: 29 (9) , n = 325, P = 0.70 *Pneumonia-related mortality, number (%):* Intervention: 15 (5); Control: 23 (7), P = 0.44	*Length of index hospital (days) stay*, median (IQR): Intervention: 5.0 (3.0 to 7.0); Control: 5.0 (3. 0 to 8.0); Hazard ratio (95% CI): 1.16 (0.97 to 1.38), P = 0. 11 *Rehospitalisation*[7] *number (%):* Intervention:37 (14) ; Control:33 (11), P = 0.42 *Duration (days) of intravenous antibiotic therapy*, median (IQR): Intervention: 3.0 (2.0 to 5.0),n = 283; Control: 4.0 (2. 6 to 6.0), n = 325; Hazard ratio (95% CI): 1.23 (1.00 to 1. 52), P = 0.06	-

Table 4. Results: Other outcomes (*Continued*)

Shah 2014	***Clinical data study:*** Intervention: n = 40 practices/795 patients; Control: n = 40 practices/797 patients *Cardiovascular risk reduction (secondary outcomes)*: Proportion of participants reaching glycaemic control targets (HbA1c < 7.0%): Intervention: 58.5%; Control: 58.8%; OR 0.93 (0.71 to 1.21), P = 0.58 Proportion of participants reaching blood pressure control targets (< 130/80): Intervention: 52.8%; Control: 63.5%, OR 0.72 (0.53 to 0.98), P = 0.04 Proportion of participants reaching LDL-cholesterol control targets (< 2.0 mmol/L): Intervention: 59.2%; Control: 61.7% , OR 0.90 (0.68 to 1.18), P = 0.43 Proportion of participants reaching Total to HDL-cholesterol ratio (< 4.0) : Intervention: 74.2%; Control: 76.8%, OR 0.85 (0.63 to1.14), P = 0.27 *Clinical (secondary outcomes)*: When HbA1c > 8.0%: Intervention:	-	***Administrative data study*** : Intervention: 2008 practices (467,713 participants); Control: 1999 practices (466,076 participants) ***Primary outcome: Death or non-fatal myocardial infarction***: Intervention: 2.5%; Control: 2.5%; OR 1.00 (0.96 to 1.03), P = 0.77 Secondary outcomes: Medication initiation (ACEI/ARB > 1 antihypertensive class, or > 2, or > 3, statin, glucose-lowering drugs, insulin, nitrate): OR, range: from 0.96 to 1.02, P values from 0.03 to 0.94	***Clinical data study:*** ***Primary outcome: Proportion of participants prescribed statins*** (new or renewed prescription) : Intervention: 700 (88.1%); Control: 725 (90.1%); OR 0.73, 95% CI 0.42 to 1.26, P = 0.26 *Proportion of participants prescribed an ACEI/ARB:* Intervention: Control: Secondary outcome. ***Administrative data study*** : Secondary outcomes: CAD assessment (electrocardiogram, cardiac stress test, nuclear imaging, coronary angiography, coronary revascularisation, cardiology or internal medicine visit): OR, range: from 0.96 to 1.00, P values from 0.02 to 0.83	-

Table 4. Results: Other outcomes (*Continued*)

	11.8%; Control: 13.0%, OR 0.98 (0.48 to 1.98), P = 0.95 When blood pressure > 140/90: Intervention: 5.6%; Control: 7.2%, OR 0.67 (0.25 to 1.82), P = 0.43 When LDL cholesterol > 3.0 mmol/L: Intervention: 43.5%; Control: 45.2%, OR 0.94 (0.53 to 1.67), P = 0.83 ***Administrative data study*** : Intervention: 2008 practices (467,713 participants); Control: 1999 practices (466,076 participants) Secondary outcomes: Clinical events (all-cause death, MI, MI or unstable angina, stroke, stroke or TIA, and combined outcomes): OR: from 0.98 to 1.04, P values from 0.21 to 0.96				

[1]EQ-5D: a standardised instrument for use as a measure of health outcome.The EQ-5D has five dimensions: mobility, self-care, usual activity,pain/discomfort and anxiety/depression. Each dimension has three levels, no problems, some problems and serious problems. Hence, EQ-5D has 243 possible health states. Utility values of the general public for these health states as measured with the time tradeoff technique on a random sample of the adult population of the United Kingdom, the MVH-A1 tariff, were applied in this study. The scores range from −0.594 (worst situation) to 1.0 (perfect health).

[2]The direct costs consisted of costs of the dissemination of the guideline and the costs of the healthcare utilisation of the patients. Prices for the year 2002.

[3]SF-12 health scores were assessed in all patients able to provide reliable self-report data during the 30-day interview, excluding 6 intervention-arm and 6 control-arm patients with missing data.

[4]Patient satisfaction with care was assessed for all patients with a 30-day interview that was not completed by a paid caregiver, excluding four intervention-arm and two control-arm patients with missing data. An additional two patients in the intervention arm and six patients in the control arm were hospitalised for the full 30 days and were not asked about length of hospital stay. SF-12, 12-Item Short Form was used.

[5]Return to usual activities among non-workers was assessed for 183 intervention arm and 219 control arm patients not employed at baseline who completed a 30-day interview. Return to usual activities among workers was assessed in 59 intervention-arm and

59 control-arm patients employed at baseline. Return to work was assessed among 54 intervention-arm and 53 control-arm patients employed at baseline.
[6]Mortality, medical complications, and return to work and usual activities were adjusted for pneumonia severity risk class.
[7]Rehospitalisation within 30 days of the index admission was assessed for all patients who were discharged alive from either the index hospitalisation or another acute-care facility (if transferred to an acute-care facility from the index hospitalisation).
[8]Fluid fasting times assessed by local investigator asking the patient about the fasting time, and checking this information against medical notes.
[9]Cost for designing, editing, reproducing, and posting need when applied to 170 acute trusts.
[10]Cost of providing 170 acute trusts with implementation support through a web-based resource championed through opinion leadership. This includes development costs for the tool (which for this project were in-house costs, in other cases external agencies may have to be used which are likely to be three times higher), publicity materials, training materials and opinion leader time and activity.

Table 5. Results: Adherence outcomes

Author Year	Adherence Outcomes	Participants (Settings)	Control Adherence	Intervention Adherence	Median ARD
Bekkering 2005 (Hoijenboos 2005) Targeted behaviour: management of non specific low back pain GL tool used: interactive training workshop X2	Adherence to 4 guideline recommendations: i) Limit number of sessions in normal course back pain ii) Set functional treatment goals iii) Use mainly active interventions iv) Give adequate information **Note:** an increase was desirable for all outcomes	113 physiotherapists (68 private physiotherapy practices)	i) Post: 14 (13), n = 253 ii) Post: 180 (71) iii) Post: 154 (60) iv) Post: 221 (87)	i) Post: 32 (27), n = 247 ii) Post: 188 (79) iii) Post: 183 (77) iv) Post: 229 (96)	+0.115 11.5% higher adherence in the intervention group i) 0.14% ii) 0.08% iii) 0.17% iv) 0.09%
Daucourt 2003 Targeted behaviour: appropriate thyroid function testing Guideline tool used: 1) Dual intervention (2 + 3); 2) Order request form; 3) Pocket memorandum card	Global Guideline Conformity Rate	1412 physicians (6 general hospitals)	Pre: 62.0% (95% CI 47.7 to 76.4)	Dual intervention group: Post: 77.9% (95% CI 68.9 to 87.0) *Note*: only results for the dual intervention presented here	+0.159%
Fine 2003 Targeted behaviour: appropriate duration of	No adherence outcomes reported, only proxies	545 physicians (7 not-for-profit hospitals)	-	-	-

Table 5. Results: Adherence outcomes (*Continued*)

intravenous antibiotic therapy for treatment of pneumonia **GL tool used: detail sheet/ treatment recommendations+ telephone reminder**					
Shah 2014 **Targeted behaviour: improved cardiovascular risk factor management in people with diabetes** **Guideline tool used: printed educational material**	No adherence outcomes reported, only proxies	2 separate studies: Administrative data study: n = 4007 practices: Intervention: 2008; Control: 1999 Clinical data study. n = 80 practices (1592 patients); Intervention: 40 practices (8795 patients) ; Control: 40 practices (8797 patients)	-	-	-

APPENDICES

Appendix 1. Medline search strategies

MEDLINE (OvidSP) (1946 to present, In process) - February 2016

#	Searches
1	("United States Agency for Healthcare Research and Quality"/ or Health Maintenance Organization/) and practice guidelines as topic/
2	("United States Agency for Healthcare Research and Quality"/ or Health Maintenance Organization/) and Guideline Adherence/
3	(health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint or AHCPR).ti,in. and (guideline* or guidance or standard*1 or pathway*1 or protocol*1).ti
4	1 or 2 or 3

(*Continued*)

5	"comment on".cm. or systematic review.ti. or literature review.ti. or editorial.pt. or meta-analysis.pt. or news.pt. or review.pt
6	4 not 5
7	exp animals/ not humans/
8	6 not 7
9	limit 8 to yr="1998 -Current"
10	*Guideline Adherence/
11	(guideline* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
12	(guidance and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
13	(standard? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
14	(pathway? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
15	(protocol? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
16	10 or 11 or 12 or 13 or 14 or 15
17	(national adj3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
18	(regional adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
19	(society adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
20	(association adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
21	(academy adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
22	(board adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
23	(institute? adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
24	(ministry adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
25	(department? adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab

(*Continued*)

26	((health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint) and (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
27	exp Managed Care Programs/ and (guideline* or guidance or standard*1 or pathway*1 or protocol*1).ti,ab,hw
28	17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27
29	(implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*).ti,ab,hw
30	28 and 29
31	practice guidelines as topic/
32	(practice adj3 (guideline*1 or guidance or standard*1 or pathway*1)).ti,ab
33	(clinical adj3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
34	31 or 32 or 33
35	Guideline Adherence/
36	Health Plan Implementation/
37	(guideline* adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
38	(guidance adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
39	(standard? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
40	(pathway? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
41	(protocol? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
42	35 or 36 or 37 or 38 or 39 or 40 or 41
43	34 and 42
44	16 or 30 or 43
45	"comment on".cm. or systematic review.ti. or literature review.ti. or editorial.pt. or meta-analysis.pt. or news.pt. or review.pt

(*Continued*)

46	44 not 45
47	exp animals/ not humans/
48	46 not 47
49	randomized controlled trial.mp. or controlled clinical trial.pt. or randomized.ab. or placebo.ab. or clinical trials as topic.sh. or randomly.ab. or trial.ti
50	48 and 49
51	limit 50 to yr="1998 -Current"
52	Program Evaluation/
53	Program Development/
54	Intervention Studies/
55	intervention*.ti.
56	(intervention* adj6 (clinician* or collaborat* or community or complex or DESIGN* or doctor* or educational or family doctor* or family physician* or family practitioner* or financial or GP or general practice* or hospital* or impact* or improv* or individuali?e* or individuali?ing or interdisciplin* or multicomponent or multi-component or multidisciplin* or multi-disciplin* or multifacet* or multi-facet* or multimodal* or multi-modal* or personali?e* or personali?ing or pharmacies or pharmacist* or pharmacy or physician* or practitioner* or prescrib* or prescription* or primary care or professional* or provider* or regulatory or regulatory or tailor* or target* or team* or usual care)).ab
57	(collaborativ* or collaboration* or tailored or personali?ed).ti,ab
58	(exp hospitals/ or exp Hospitalization/ or exp Patients/ or exp Nurses/ or exp Nursing/) and (study.ti. or evaluation studies as topic/)
59	demonstration project*.ti,ab.
60	(pre-post or "pre test*" or pretest* or posttest* or "post test*" or (pre adj5 post)).ti,ab
61	(pre-workshop or post-workshop or (before adj3 workshop) or (after adj3 workshop)).ti,ab
62	((study adj3 aim?) or "our study").ab.
63	(before adj10 (after or during)).ti,ab.
64	("quasi-experiment*" or quasiexperiment* or "quasi random*" or quasirandom* or "quasi control*" or quasicontrol* or ((quasi* or experimental) adj3 (method* or study or trial or design*))).ti,ab,hw
65	("time series" adj2 interrupt*).ti,ab,hw.

(*Continued*)

66	(time points adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month* or hour? or day? or "more than")).ab
67	pilot.ti.
68	Pilot projects/
69	clinical trial.pt.
70	multicenter study.pt.
71	(multicentre or multicenter or multi-centre or multi-center).ti
72	random*.ti,ab. or controlled.ti.
73	(control adj3 (area or cohort? or compar? or condition or group? or intervention? or participant? or study)).ab
74	(cluster* adj3 (random* or trial*)).ti,ab.
75	52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74
76	48 and 75
77	limit 76 to yr="1998 -Current"
78	9 or 51 or 77
79	(2013* or 2014* or 2015*).ed,dp,yr.
80	9 and 79
81	51 and 79
82	77 and 79

Appendix 2. Embase search strategy

1	(Health Maintenance Organization/ or managed care organization/ or preferred provider organization/ or pharmacy benefit manager/) and practice guideline/
2	(Health Maintenance Organization/ or managed care organization/ or preferred provider organization/ or pharmacy benefit manager/) and (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1).ti

(*Continued*)

3	(health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint or AHCPR).ti,in. and (guideline* or guidance or standard*1 or pathway*1 or protocol*1).ti
4	1 or 2 or 3
5	review.ti.
6	(animal$ not human$).sh,hw. or (rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?).ti
7	5 or 6
8	4 not 7
9	limit 8 to yr="1998 -Current"
10	(guideline* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
11	(guidance and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
12	(standard? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
13	(pathway? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
14	(protocol? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
15	10 or 11 or 12 or 13 or 14
16	(national adj3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
17	(regional adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
18	(society adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
19	(association adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
20	(academy adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
21	(board adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
22	(institute? adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab

(*Continued*)

23	(ministry adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
24	(department? adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
25	((health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint) and (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
26	exp managed care/ and (guideline* or guidance or standard*1 or pathway*1 or protocol*1).ti,ab,hw
27	16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26
28	(implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*).ti,ab,hw
29	27 and 28
30	*practice guideline/
31	(practice adj3 (guideline*1 or guidance or standard*1 or pathway*1)).ti,ab
32	(clinical adj3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
33	30 or 31 or 32
34	(guideline* adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
35	(guidance adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
36	(standard? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
37	(pathway? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
38	(protocol? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
39	34 or 35 or 36 or 37 or 38
40	33 and 39
41	15 or 29 or 40

(*Continued*)

42	(random$ or factorial$ or crossover$ or cross over$ or cross-over$ or placebo$ or (doubl$ adj blind$) or (singl$ adj blind$) or assign$ or allocat$ or volunteer$).ti,ab. or crossover-procedure/ or double-blind procedure/ or randomized controlled trial/ or single-blind procedure/
43	41 and 42
44	review.ti.
45	(animal$ not human$).sh,hw. or (rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?).ti
46	44 or 45
47	43 not 46
48	limit 47 to yr="1998 -Current"
49	intervention?.ti. or (intervention? adj6 (clinician? or collaborat$ or community or complex or DESIGN$ or doctor? or educational or family doctor? or family physician? or family practitioner? or financial or GP or general practice? or hospital? or impact? or improv$ or individuali?e? or individuali?ing or interdisciplin$ or multicomponent or multi-component or multidisciplin$ or multi-disciplin$ or multifacet$ or multi-facet$ or multimodal$ or multi-modal$ or personali?e? or personali?ing or pharmacies or pharmacist? or pharmacy or physician? or practitioner? or prescrib$ or prescription? or primary care or professional$ or provider? or regulatory or regulatory or tailor$ or target$ or team$ or usual care)).ab
50	(pre-intervention? or preintervention? or "pre intervention?" or post-intervention? or postintervention? or "post intervention? ").ti,ab
51	(hospital$ or patient?).hw. and (study or studies or care or health$ or practitioner? or provider? or physician? or nurse? or nursing or doctor?).ti,hw
52	demonstration project?.ti,ab.
53	(pre-post or "pre test$" or pretest$ or posttest$ or "post test$" or (pre adj5 post)).ti,ab
54	(pre-workshop or post-workshop or (before adj3 workshop) or (after adj3 workshop)).ti,ab
55	trial.ti. or ((study adj3 aim?) or "our study").ab.
56	(before adj10 (after or during)).ti,ab.
57	(time points adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month$ or hour? or day? or "more than")).ab
58	pilot.ti.
59	(multicentre or multicenter or multi-centre or multi-center).ti
60	random$.ti,ab. or controlled.ti.

(*Continued*)

61	*experimental design/ or *pilot study/ or quasi experimental study/
62	("quasi-experiment$" or quasiexperiment$ or "quasi random$" or quasirandom$ or "quasi control$" or quasicontrol$ or ((quasi$ or experimental) adj3 (method$ or study or trial or design$))).ti,ab
63	("time series" adj2 interrupt$).ti,ab.
64	or/49-63
65	41 and 64
66	review.ti.
67	(animal$ not human$).sh,hw. or (rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?).ti
68	66 or 67
69	65 not 68
70	9 or 48 or 69
71	(2013* or 2014* or 2015*).em,dp,yr.
72	9 and 71
73	48 and 71
74	69 and 71

Appendix 3. Psychinfo search strategy

1	(Health Maintenance Organizations/ or exp Professional organizations/ or Government Agencies/) and Treatment Guidelines/
2	(Health Maintenance Organizations/ or exp Professional organizations/ or Government Agencies/) and (guideline* or guidance or standard*1 or pathway*1 or protocol*1).ti
3	(health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint or AHCPR).ti,in. and (guideline* or guidance or standard*1 or pathway*1 or protocol*1).ti

(*Continued*)

4	1 or 2 or 3
5	review.ti.
6	(rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?).ti. or exp animals/ or animal?.ti,id,hw
7	5 or 6
8	4 not 7
9	limit 8 to yr="1998 -Current"
10	(guideline* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
11	(guidance and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
12	(standard? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
13	(pathway? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
14	(protocol? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
15	10 or 11 or 12 or 13 or 14
16	(national adj3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
17	(regional adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
18	(society adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
19	(association adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
20	(academy adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
21	(board adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
22	(institute? adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
23	(ministry adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
24	(department? adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab

(*Continued*)

25	((health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint) and (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
26	exp Managed Care/ and (guideline* or guidance or standard*1 or pathway*1 or protocol*1).ti,ab,hw
27	16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26
28	(implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*).ti,ab,hw
29	27 and 28
30	Treatment Guidelines/
31	(practice adj3 (guideline*1 or guidance or standard*1 or pathway*1)).ti,ab
32	(clinical adj3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
33	30 or 31 or 32
34	(guideline* adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
35	(guidance adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
36	(standard? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
37	(pathway? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
38	(protocol? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
39	34 or 35 or 36 or 37 or 38
40	33 and 39
41	15 or 29 or 40
42	(random or trial* or controlled stud or placebo* or ((singl* or doubl* or trebl* or tripl*) adj2 (blind* or mask*)) or cross over or crossover or factorial* or assign* or allocat* or volunteer*).ti,ab,hw,id. or treatment effectiveness evaluation/ or mental health program evaluation/ or exp experimental design/ or "2000".md
43	41 and 42

(*Continued*)

44	review.ti.
45	(rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?).ti. or exp animals/ or animal?.ti,id,hw
46	44 or 45
47	43 not 46
48	limit 47 to yr="1998 -Current"
49	intervention?.ti. or (intervention? adj6 (clinician? or collaborat$ or community or complex or DESIGN$ or doctor? or educational or family doctor? or family physician? or family practitioner? or financial or GP or general practice? or hospital? or impact? or improv$ or individuali?e? or individuali?ing or interdisciplin$ or multicomponent or multi-component or multidisciplin$ or multi-disciplin$ or multifacet$ or multi-facet$ or multimodal$ or multi-modal$ or personali?e? or personali?ing or pharmacies or pharmacist? or pharmacy or physician? or practitioner? or prescrib$ or prescription? or primary care or professional$ or provider? or regulatory or regulatory or tailor$ or target$ or team$ or usual care)).ab
50	(pre-intervention? or preintervention? or "pre intervention?" or post-intervention? or postintervention? or "post intervention?").ti,ab
51	(hospital$ or patient?).hw. and (study or studies or care or health$ or practitioner? or provider? or physician? or nurse? or nursing or doctor?).ti,hw
52	demonstration project?.ti,ab.
53	(pre-post or "pre test$" or pretest$ or posttest$ or "post test$" or (pre adj5 post)).ti,ab
54	(pre-workshop or post-workshop or (before adj3 workshop) or (after adj3 workshop)).ti,ab
55	trial.ti. or ((study adj3 aim?) or "our study").ab.
56	(before adj10 (after or during)).ti,ab.
57	("quasi-experiment$" or quasiexperiment$ or "quasi random$" or quasirandom$ or "quasi control$" or quasicontrol$ or ((quasi$ or experimental) adj3 (method$ or study or trial or design$))).ti,ab,hw
58	("time series" adj2 interrupt$).ti,ab,hw.
59	(time points adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month$ or hour? or day? or "more than")).ab
60	pilot.ti.
61	(multicentre or multicenter or multi-centre or multi-center).ti
62	random$.ti,ab. or controlled.ti.

(*Continued*)

63	(control adj3 (area or cohort? or compare? or condition or design or group? or intervention? or participant? or study)).ab. not (controlled clinical trial or randomized controlled trial).pt
64	experimental design/ or between groups design/ or quantitative methods/ or quasi experimental methods/
65	or/49-64
66	41 and 65
67	review.ti.
68	(rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?).ti. or exp animals/ or animal?.ti,id,hw
69	67 or 68
70	66 not 69
71	limit 70 to yr="1998 -Current"
72	9 or 48 or 71
73	(2013* or 2014* or 2015*).dp,up,yr.
74	9 and 73
75	48 and 73
76	71 and 73

Appendix 4. Cinahl search strategy

1	((MH "Health Maintenance Organizations") OR (MH "Independent Practice Associations") OR (MH "Preferred Provider Organizations") OR (MH "Provider-Sponsored Organizations")) AND (MH "Practice Guidelines")
2	((MH "Health Maintenance Organizations") OR (MH "Independent Practice Associations") OR (MH "Preferred Provider Organizations") OR (MH "Provider-Sponsored Organizations")) AND (MH "Guideline Adherence")
3	(TI ((health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint or AHCPR)) OR AF ((health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint or AHCPR))) AND TI (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols)
4	1 OR 2 OR 3

(*Continued*)

5	TI review
6	(MH "Animals+") NOT (MH "Human")
7	TI (rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?) OR MW animal?
8	5 OR 6 OR 7
9	4 NOT 8
10	TI ((guideline* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR TI ((guidance and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR TI ((standard? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR TI ((pathway? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR TI ((protocol? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
11	TI ((national n3 (guideline*1 or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR TI ((regional n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR TI ((society n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR TI ((association n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR TI ((academy n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR TI ((board n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR TI ((institute? n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR TI ((ministry n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR TI ((department? n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR TI (((health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint) and (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols)))
12	AB ((national n3 (guideline*1 or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR AB ((regional n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR AB ((society n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR AB ((association n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR AB ((academy n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR AB ((board n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR AB ((institute? n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR AB ((ministry n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR AB ((department? n3 (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols))) OR AB (((health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint) and (guideline* or guidance or standard or standards or pathway or pathways or protocol or protocols)))
13	(MH "Managed Care Programs+") AND TI (guideline*1 or guidance or standard or standards or pathway or pathways or protocol or protocols)

(*Continued*)

14	(MH "Managed Care Programs+") AND AB (guideline*1 or guidance or standard or standards or pathway or pathways or protocol or protocols)
15	(MH "Managed Care Programs+") AND MW (guideline*1 or guidance or standard or standards or pathway or pathways or protocol or protocols)
16	11 OR 12 OR 13 OR 14 OR 15
17	TI (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*) OR AB (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*) OR MW (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)
18	16 AND 17
19	(MH "Practice Guidelines")
20	TI ((practice n3 (guideline*1 or guidance or standard*1 or pathway*1))) OR AB ((practice n3 (guideline*1 or guidance or standard*1 or pathway*1))) OR TI ((clinical n3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1))) OR AB ((clinical n3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1)))
21	19 OR 20
22	(MH "Guideline Adherence")
23	(MH "Program Implementation") OR (MH "Systems Implementation")
24	TI ((guideline* n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR AB ((guideline* n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
25	TI ((guidance n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR AB ((guidance n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
26	TI ((standard? n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR AB ((standard? n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
27	TI ((pathway? n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR AB ((pathway? n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))

(*Continued*)

28	TI ((protocol? n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR AB ((protocol? n5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
29	22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28
30	21 AND 29
31	10 OR 18 OR 30
32	((MH "Clinical Trials") OR (MH "Double-Blind Studies") OR (MH "Randomized Controlled Trials") OR (MH "Single-Blind Studies") OR (MH "Triple-Blind Studies")) OR (TI ((random* or factorial* or crossover* or cross over* or cross-over* or placebo* or (doubl* n2 blind*) or (singl* n2 blind*) or assign* or allocat* or volunteer*)) OR AB ((random* or factorial* or crossover* or cross over* or cross-over* or placebo* or (doubl* n2 blind*) or (singl* n2 blind*) or assign* or allocat* or volunteer*)))
33	31 AND 32
34	TI review
35	TI (rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?) OR MW animal?
36	(MH "Animals+") NOT (MH "Human")
37	34 or 35 or 36
38	33 NOT 37
39	(MH "Quasi-Experimental Studies")
40	TI (intervention* or multiintervention* or multi-intervention* or postintervention* or post-intervention* or preintervention* or pre-intervention*) or AB (intervention* or multiintervention* or multi-intervention* or postintervention* or post-intervention* or preintervention* or pre-intervention*)
41	TI (pre-test* or pretest* or posttest* or post-test*) or AB (pre-test* or pretest* or posttest* or "post test*) OR TI (preimplement*" or pre-implement*) or AB (pre-implement* or preimplement*)
42	MH Experimental Studies or Community Trials or Community Trials or Pretest-Posttest Design + or Quasi-Experimental Studies + Pilot Studies or Policy Studies + Multicenter Studies
43	TI ((comparative N2 study) or (comparative N2 studies) or evaluation study or evaluation studies) or AB ((comparative N2 study) or (comparative N2 studies) or evaluation study or evaluation studies)
44	MH "Multiple Time Series" or MH "Time Series"
45	TI pre w7 post or AB pre w7 post

(*Continued*)

46	TI ((quasi-experiment* or quasiexperiment* or quasi-random* or quasirandom* or quasi control* or quasicontrol* or quasi* W3 method* or quasi* W3 study or quasi* W3 studies or quasi* W3 trial or quasi* W3 design* or experimental W3 method* or experimental W3 study or experimental W3 studies or experimental W3 trial or experimental W3 design*)) or AB ((quasi-experiment* or quasiexperiment* or quasi-random* or quasirandom* or quasi control* or quasicontrol* or quasi* W3 method* or quasi* W3 study or quasi* W3 studies or quasi* W3 trial or quasi* W3 design* or experimental W3 method* or experimental W3 study or experimental W3 studies or experimental W3 trial or experimental W3 design*))
47	TI ((time point*) or (period* n4 interrupted) or (period* n4 multiple) or (period* n4 time) or (period* n4 various) or (period* n4 varying) or (period* n4 week*) or (period* n4 month*) or (period* n4 year*)) or AB ((time point*) or (period* n4 interrupted) or (period* n4 multiple) or (period* n4 time) or (period* n4 various) or (period* n4 varying) or (period* n4 week*) or (period* n4 month*) or (period* n4 year*))
48	AB (before* n10 during or before n10 after) or AU (before* n10 during or before n10 after)
49	TI time series or AB time series or AB "before-and-after"
50	(MH "Pilot Studies")
51	TI pilot
52	TI (collaborativ* or collaboration* or tailored or personalised or personalized) or AB (collaborativ* or collaboration* or tailored or personalised or personalized)
53	(intervention n6 clinician*) or (intervention n6 community) or (intervention n6 complex) or (intervention n6 design*) or (intervention n6 doctor*) or (intervention n6 educational) or (intervention n6 family doctor*) or (intervention n6 family physician*) or (intervention n6 family practitioner*) or (intervention n6 financial) or (intervention n6 GP) or (intervention n6 general practice*) Or (intervention n6 hospital*) or (intervention n6 impact*) Or (intervention n6 improv*) or (intervention n6 individualize*) Or (intervention n6 individualise*) or (intervention n6 individualizing) or (intervention n6 individualising) or (intervention n6 interdisciplin*) or (intervention n6 multicomponent) or (intervention n6 multi-component) or (intervention n6 multidisciplin*) or (intervention n6 multi-disciplin*) or (intervention n6 multifacet*) or (intervention n6 multi-facet*) or (intervention n6 multimodal*) or (intervention n6 multi-modal*) or (intervention n6 personalize*) or(intervention n6 personalise*) or (intervention n6 personalizing) or (intervention n6 personalising) or (intervention n6 pharmaci*) or (intervention n6 pharmacist*) or (intervention n6 pharmacy) or (intervention n6 physician*) or (intervention n6 practitioner*) Or (intervention n6 prescrib*) or (intervention n6 prescription*) or (intervention n6 primary care) or (intervention n6 professional*) or (intervention* n6 provider*) or (intervention* n6 regulatory) or (intervention n6 regulatory) or (intervention n6 tailor*) or (intervention n6 target*) or (intervention n6 team*) or (intervention n6 usual care)
54	TI (demonstration project OR demonstration projects OR preimplement* or pre-implement* or post-implement* or postimplement*) or AB (demonstration project OR demonstration projects OR preimplement* or pre-implement* or post-implement* or postimplement*)
55	TI (pre-workshop or preworkshop or post-workshop or postworkshop or (before n3 workshop) or (after n3 workshop)) or AB (pre-workshop or preworkshop or post-workshop or postworkshop or (before n3 workshop) or (after n3 workshop))
56	TI (trial or (study n3 aim) or "our study") or AB ((study n3 aim) or "our study")
57	TI (multicentre or multicenter or multi-centre or multi-center)

(*Continued*)

58	TI ((control w3 area) or (control w3 cohort*) or (control w3 compar*) or (control w3 condition) or (control w3 group*) or (control w3 intervention*) or (control w3 participant*) or (control w3 study)) or AB ((control w3 area) or (control w3 cohort*) or (control w3 compar*) or (control w3 condition) or (control w3 group*) or (control w3 intervention*) or (control w3 participant*) or (control w3 study))
59	TI ((time points n3 over) or (time points n3 multiple) or (time points n3 three) or (time points n3 four) or (time points n3 five) or (time points n3 six) or (time points n3 seven) or (time points n3 eight) or (time points n3 nine) or (time points n3 ten) or (time points n3 eleven) or (time points n3 twelve) or (time points n3 month*) or (time points n3 hour*) or (time points n3 day*) or (time points n3 "more than")) or AB ((time points n3 over) or (time points n3 multiple) or (time points n3 three) or (time points n3 four) or (time points n3 five) or (time points n3 six) or (time points n3 seven) or (time points n3 eight) or (time points n3 nine) or (time points n3 ten) or (time points n3 eleven) or (time points n3 twelve) or (time points n3 month*) or (time points n3 hour*) or (time points n3 day*) or (time points n3 "more than"))
60	39 OR 40 OR 41 OR 42 OR 43 OR 44 OR 45 OR 46 OR 47 OR 48 OR 49 OR 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58 OR 59
61	31 AND 60
62	TI review
63	TI (rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?) OR MW animal?
64	(MH "Animals+") NOT (MH "Human")
65	62 OR 63 OR 64
66	61 NOT 65

Appendix 5. Cochrane search strategy

#1	MeSH descriptor: [Health Maintenance Organizations] explode all trees
#2	MeSH descriptor: [United States Agency for Healthcare Research and Quality] explode all trees
#3	#1 or #2
#4	MeSH descriptor: [Practice Guidelines as Topic] explode all trees
#5	MeSH descriptor: [Guideline Adherence] explode all trees
#6	#4 or #5
#7	#3 and #6

(*Continued*)

#8	health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint or AHCPR:ti (Word variations have been searched)
#9	guideline or guidelines or guidance or standard or standards or pathway or pathways or protocol or protocols:ti (Word variations have been searched)
#10	#8 and #9
#11	#7 or #10
#12	MeSH descriptor: [Guideline Adherence] explode all trees
#13	(guideline* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti (Word variations have been searched)
#14	(guidance and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti (Word variations have been searched)
#15	(standard* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti (Word variations have been searched)
#16	(pathway* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti (Word variations have been searched)
#17	(protocol* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti (Word variations have been searched)
#18	#12 or #13 or #14 or #15 or #16 or #17
#19	(national near/3 (guideline* or guidance or standard* or pathway* or protocol*)):ti,ab,kw (Word variations have been searched)
#20	(regional near/3 (guideline* or guidance or standard* or pathway* or protocol*)):ti,ab,kw (Word variations have been searched)
#21	(society near/3 (guideline* or guidance or standard* or pathway* or protocol*)):ti,ab,kw (Word variations have been searched)
#22	(association near/3 (guideline* or guidance or standard* or pathway* or protocol*)):ti,ab,kw (Word variations have been searched)
#23	(academy near/3 (guideline* or guidance or standard* or pathway* or protocol*)):ti,ab,kw (Word variations have been searched)
#24	(board near/3 (guideline* or guidance or standard* or pathway* or protocol*)):ti,ab,kw (Word variations have been searched)
#25	(institute? near/3 (guideline* or guidance or standard* or pathway* or protocol*)):ti,ab,kw (Word variations have been searched)
#26	(ministry near/3 (guideline* or guidance or standard* or pathway* or protocol*))
#27	(department? near/3 (guideline* or guidance or standard* or pathway* or protocol*))

(*Continued*)

#28	((health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint) and (guideline* or guidance or standard* or pathway* or protocol*)):ti,ab,kw (Word variations have been searched)
#29	MeSH descriptor: [Managed Care Programs] explode all trees
#30	guideline* or guidance or standard* or pathway* or protocol*:ti,ab,kw (Word variations have been searched)
#31	29 and 30
#32	#19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #28 or #31
#33	implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*:ti,ab,kw (Word variations have been searched)
#34	#32 and #33
#35	MeSH descriptor: [Practice Guidelines as Topic] explode all trees
#36	(practice near/3 (guideline* or guidance or standard* or pathway*)):ti,ab,kw (Word variations have been searched)
#37	(clinical near/3 (guideline* or guidance or standard* or pathway* or protocol*)):ti,ab,kw (Word variations have been searched)
#38	#35 or #36 or #37
#39	MeSH descriptor: [Guideline Adherence] explode all trees
#40	MeSH descriptor: [Health Plan Implementation] explode all trees
#41	(guideline* near/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti,ab,kw (Word variations have been searched)
#42	(guidance near/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti,ab,kw (Word variations have been searched)
#43	(standard? near/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti,ab,kw (Word variations have been searched)
#44	(pathway? near/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti,ab,kw (Word variations have been searched)
#45	(protocol? near/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)):ti,ab,kw (Word variations have been searched)

(*Continued*)

#46	#39 or #40 or #41 or #42 or #43 or #44 or #45
#47	#38 and #46
#48	#11 or #18 or #34 or #47

Appendix 6. Proquest search strategy

Set	Search
S9	(S1 OR S2 OR S4 OR S6) AND S5Limits applied
S7	(S1 OR S2 OR S4 OR S6) AND S5
S6	ti(practice guideline* OR clinical guideline* OR practice guidance OR clinical guidance OR practice protocol* OR clinical protocol* OR practice standard* OR clinical standard* OR practice pathway* OR clinical pathway*) AND ab(implement* OR uptake* OR adopt* OR adhere* OR concord* OR complian* OR comply OR non-adhere* OR nonadhere* OR non-concord* OR nonconcord* OR non-complian* OR noncomplian*)
S5	ti(random* OR factorial* OR crossover* OR cross over* OR cross-over* OR placebo* OR blind* OR assign* OR allocat* OR volunteer*) OR ab(random* OR factorial* OR crossover* OR cross over* OR cross-over* OR placebo* OR blind* OR assign* OR allocat* OR volunteer*)
S4	ab(((national OR regional OR society OR association OR academy OR board OR institute* OR ministry OR department) near (guideline* OR guidance OR standard* OR pathway* OR protocol*))) AND ab(implement* OR uptake* OR adopt* OR adhere* OR concord* OR compliant* OR comply OR non-adhere* OR nonadhere* OR non-concord* OR nonconcord* OR noncomplian* OR noncomplian*)
S2	ti(health maintenance organi?ation* OR hmo? OR Aetna OR Blue Cross Blue Shield Association OR CIGNA OR Kaiser Permanente OR Humana OR Health Net OR UnitedHealth Group OR Wellpoint OR AHCPR) AND ti(guideline* OR guidance OR standard* OR pathway* OR protocol*)
S1	ti(((guideline*or guidance OR standard? OR protocol? OR pathways?) AND (implement* OR uptake* OR adopt* OR adhere* OR concord* OR complian* OR comply OR non-adhere* OR nonadhere* OR non-concord* OR nonconcord* OR non-complian* OR noncomplian*)))

Appendix 7. WoK search strategy

1	TI=((health maintenance organisation* or health maintenance organization* or hmo or hmos or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint or AHCPR)) OR AD=((health maintenance organisation* or health maintenance organization* or hmo or hmos or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint or AHCPR))
2	TI=(guideline* or guidance or standard* or pathway* or protocol*)
3	2 AND 1
4	TI=review
5	TI=(rat or rats or cow or cows or chicken? or horse or horses or mice or mouse or bovine or animal?)
6	5 OR 4
7	3 NOT 6
8	TI=((guideline* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
9	TI=((guidance and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
10	TI=((standard? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
11	TI=((pathway? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
12	TI=((protocol? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
13	12 OR 11 OR 10 OR 9 OR 8
14	TS=((regional NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
15	TS=((national NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
16	TS=((society NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
17	TS=((association NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
18	TS=((academy NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
19	TS=((board NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))

(*Continued*)

20	TS=((institute? NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
21	TS=((ministry NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
22	TS=((department? NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
23	TS=((“Managed Care Program*” NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
24	23 OR 22 OR 21 OR 20 OR 19 OR 18 OR 17 OR 16 OR 15 OR 14
25	TS=(implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)
26	25 AND 24
27	TS=((practice NEAR/3 (guideline* or guidance or standard* or pathway*))) OR TS=((clinical NEAR/3 (guideline* or guidance or standard* or pathway* or protocol*)))
28	TS=((guideline* NEAR/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR TS=((guidance NEAR/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR TS=((standard? NEAR/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR TS=((pathway? NEAR/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*))) OR TS=((protocol? NEAR/5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)))
29	28 AND 27
30	29 OR 26 OR 13
31	TS=(random* or blind* or allocat* or assign* or trial* or placebo* or crossover* or cross-over*)
32	31 AND 30
33	32 not 6
34	TI=(intervention*)
35	TS=(((intervention* SAME (clinician* or collaborat* or community or complex or DESIGN* or doctor* or educational or family doctor* or family physician* or family practitioner* or financial or GP or general practice* or hospital* or impact* or improv* or individuali*e* or individuali*ing or interdisciplin* or multicomponent or multi-component or multidisciplin* or multi-disciplin* or multifacet* or multi-facet* or multimodal* or multi-modal* or personali*e* or personali*ing or pharmacies or pharmacist* or pharmacy or physician* or practitioner* or prescrib* or prescription* or primary care or professional* or provider* or regulatory or regulatory or tailor* or target* or team* or usual care))))
36	TS=((collaborativ* OR collaboration* OR tailored OR personalised OR personalized))

(*Continued*)

37	TS=(((demonstration OR pilot) NEXT project*))
38	TI=(pilot)
39	TS=(((pre-post or "pre test*" or pretest* or posttest* or "post test*" or (pre SAME post))))
40	TS=(((pre-workshop or post-workshop or (before SAME workshop) or (after SAME workshop))))
41	TS=((((study SAME aim*) or "our study")))
42	TS=((("quasi-experiment*" or quasiexperiment* or "quasi random*" or quasirandom* or "quasi control*" or quasicontrol* or ((quasi* or experimental) SAME (method* or study or trial or design*)))))
43	TS=((("time series" SAME interrupt*)))
44	TS=(((time points SAME (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month* or hour* or day* or "more than"))))
45	TS=((multicentre or multicenter or multi-centre or multi-center))
46	TS=(((control SAME (area or cohort* or compar* or condition or group* or intervention* or participant* or study))))
47	46 OR 45 OR 44 OR 43 OR 42 OR 41 OR 40 OR 39 OR 38 OR 37 OR 36 OR 35 OR 34
48	30 AND 47
49	48 NOT 6
50	7
51	33
52	49

Appendix 8. HMIC search strategy

1	(health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint or AHCPR).ti,ab. and (guideline* or guidance or standard*1 or pathway*1 or protocol*1).ti
2	(guideline* and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti

(*Continued*)

3	(guidance and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
4	(standard? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
5	(pathway? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
6	(protocol? and (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti
7	1 or 2 or 3 or 4 or 5 or 6
8	(national adj3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
9	(regional adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
10	(society adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
11	(association adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
12	(academy adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
13	(board adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
14	(institute? adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
15	(ministry adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
16	(department? adj3 (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
17	((health maintenance organi?ation* or hmo? or Aetna or Blue Cross Blue Shield Association or CIGNA or Kaiser Permanente or Humana or Health Net or UnitedHealth Group or Wellpoint) and (guideline* or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
18	8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17
19	(implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*).ti,ab,hw
20	18 and 19
21	clinical guidelines/
22	(practice adj3 (guideline*1 or guidance or standard*1 or pathway*1)).ti,ab

(*Continued*)

23	(clinical adj3 (guideline*1 or guidance or standard*1 or pathway*1 or protocol*1)).ti,ab
24	21 or 22 or 23
25	implementation/
26	(guideline* adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
27	(guidance adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
28	(standard? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
29	(pathway? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
30	(protocol? adj5 (implement* or uptake* or adopt* or adhere* or concord* or complian* or comply or non-adhere* or nonadhere* or non-concord* or nonconcord* or non-complian* or noncomplian*)).ti,ab
31	25 or 26 or 27 or 28 or 29 or 30
32	24 and 31
33	7 or 20 or 32
34	review.ti.
35	33 not 34
36	limit 35 to yr="1998 -Current"
37	limit 35 to yr="2013 -Current"

Appendix 9. Trial registers

Trial registers:	
Clinicaltrials.gov	
(guideline OR guidelines) AND (implement OR implementation OR adopt OR adoption OR uptake)	Intervention

(*Continued*)

(guideline OR guidelines) AND (concord OR concordance OR comply OR compliance OR adherence)	Intervention
(guideline OR guidelines) AND (implement OR implementation OR adopt OR adoption OR uptake)	Title
(guideline OR guidelines) AND (concord OR concordance OR comply OR compliance OR adherence)	Title
Total:	
Duplicates:	
Final total:	
WHO ICTRP	
Guideline OR guide;ines	Intervention
guideline OR guidelines	Title
Total:	
Duplicates:	
Final Total:	

Appendix 10. Grey literature

- Open Grey (http://www.opengrey.eu/)
- Grey Literature Report (New York Academy of Medicine) (http://greylit.org/)
- Joanna Briggs Institute (http://www.joannabriggs.edu.au/Search.aspx)
- Guideline International Network (GIN) (http://www.g-i-n.net/)
- Agency for Healthcare Research and Quality (AHRQ) Guideline Clearing House (http://www.guideline.gov/) and AHRQ (www.ahrq.gov/)
- NHS Evidence, who accredit CPG producers within and outside the UK and have access to specialist collections of CPGs (http://www.evidence.nhs.uk/)
- Scottish Intercollegiate Guideline Network (SIGN) (http://www.sign.ac.uk/)
- Organisations that summarise CPGs (e.g. Map of Medicine (http://www.mapofmedicine.com/), Egton Medical Information Systems Ltd. (EMIS) (http://www.emis-online.com/)
- eGuidelines for primary care (http://www.eguidelines.co.uk/new˙guidelines.php) (eGuidelines)
- National Institute for Health and Clinical Excellence (NICE) (www.nice.org.uk/); NICE Medicine and Prescribing centre (MPC) (http://www.nice.org.uk/mpc/index.jsp) (previously the The National Prescribing Centre)
- CMA Infobase (http://www.cma.ca/index.php/ci˙id/54316/la˙id/1.htm)
- SAGE - standards and guideline evidence (http://www.partnershipagainstcancer.ca/2009/02/06/sage-standards-and-guidelines-evidence/)

Appendix 11. Websites searched

Website name/organisation	URL	Date	Search terms
OpenGrey	www.opengrey.eu/		discipline:(06*) AND guideline* AND implement*
New York Academy of Medicine: Grey Literature Report	www.greylit.org/		
GIRAnet - Guideline implementability research and application network	giranet.org/browse-gitools/		n/a browsed
International Guideline Library 1	www.g-i-n.net/library/international-guidelines-library	22/06/2015	Search 1: anything indexed as an implementation tool
International Guideline Library 2	www.g-i-n.net/library/international-guidelines-library	22/06/2015	Search 2: implement*
Relevant Literature section	www.g-i-n.net/working-groups/implementation/implementation-resources-tools	23/06/2015	implement*
Development and Training Resources: Guideline dissemination & implementation	www.g-i-n.net/working-groups/implementation/implementation-resources-tools	23/06/2015	
Past G.I.N. conferences	www.g-i-n.net/conference/past-conferences	23/06/2015	n/a browsed
Agency for Healthcare Research and Quality (AHRQ)	www.ahrq.gov/index.html	22/06/2015	(guideline OR guidelines) AND (implement OR implementing OR implementation)
Joanna Briggs Institute	www.joannabriggs.org	23/06/2015	implement*
NHS Evidence	www.evidence.nhs.uk/	23/06/2015	implement*
Scottish Intercollegiate Guideline Network (SIGN)	www.sign.ac.uk/	23/06/2015	
Map of Medicine	www.mapofmedicine.com	23/06/2015	
Egton Medical Information Systems Ltd. (EMIS)	www.emis-online.com	23/06/2015	
Guidelines in practice	www.guidelinesinpractice.co.uk	23/06/2015	

(*Continued*)

Guideline.co.uk	www.guidelines.co.uk/	23/06/2015	
NICE	www.nice.org.uk/	23/06/2015	
From National Guidelines Clearinghouse	www.guidelines.gov		
American Academy of Neurology	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.aan.com/		
American Association of Neurological Surgeons	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.aans.org/		
American College of Chest Physicians	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.chestnet.org/		
American College of Obstetricians and Gynecologists	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.acog.org/		
American College of Radiology	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.acr.org/		
American Society for Gastrointestinal Endoscopy	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.asge.org/		
American Urological Association Education and Research, Inc.	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.auanet.org/		
British Committee for Standards in Haematology	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.bcshguidelines.com/		

(*Continued*)

Cancer Care Ontario	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.cancercare.on.ca/		
CancerControl Alberta	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.albertahealthservices.ca		
Centers for Disease Control and Prevention	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.cdc.gov/		
Cincinnati Children's Hospital Medical Center	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.cincinnatichildrens.org		
Congress of Neurological Surgeons	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.cns.org/		
European Academy of Neurology	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.ea-neurology.org/		
European Association of Urology	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: uroweb.org/		
Hartford Institute for Geriatric Nursing	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.hartfordign.org/		
Institute for Clinical Systems Improvement	(guideline OR guidelines) AND (implement OR implementing OR		

(*Continued*)

	implementation) site: www.icsi.org/		
Michigan Quality Improvement Consortium	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.mqic.org/		
National Clinical Guideline Centre	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.ncgc.ac.uk/		
New York State Department of Health	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.health.ny.gov/		
Ontario Ministry of Health and Long-Term Care	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.health.gov.on.ca/en/		
Program in Evidence-based Care	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.cancercare.on.ca		
Royal College of Nursing	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.rcn.org.uk		
Royal College of Obstetricians and Gynaecologists	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.rcog.org.uk/		
Society of Obstetricians and Gynaecologists of Canada	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: sogc.org/		
U.S. Preventive Services Task Force	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.uspreventiveservicestaskforce.org/		

(*Continued*)

University of Michigan Health System	(guideline OR guidelines) AND (implement OR implementing OR implementation) site: www.uofmhealth.org/		

CONTRIBUTIONS OF AUTHORS

GF contributed to the writing of the protocol, led the screening of the studies for inclusion and data extraction, and drafted the review.

AH assisted with screening studies for inclusion and data extraction, and commented on drafts of the review.

LG assisted with screening studies for inclusion and data extraction, and commented on drafts of the review.

ME contributed to the writing of the protocol.

JG commented on the final version of the review prior to peer review.

GL suggested the topic of the review, and commented on drafts of the review.

SS contributed to the writing of the protocol, assisted with screening studies for inclusion, and commented on drafts of the review.

DECLARATIONS OF INTEREST

GF None known.

AH None known.

LG None known.

ME None known.

JG holds the Canada Research Chair in Health Knowledge Transfer and Uptake.

GL is Deputy Chief Executive and Director of Health and Social Care at the National Institute for Health and Care Excellence (NICE), and has responsibility for the implementation programme that includes the development of implementation tools.

SS None known.

SOURCES OF SUPPORT

Internal sources

- Nuffield Department of Population Health, University of Oxford., UK.

External sources

- NIHR Cochrane EPOC programme grant, UK.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Two new review authors (AH and LG), who were not involved at the protocol stage, are included in the review team.